The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

JUNE, 1926

House-Heating with Gas in Baltimore

Importance of Service, Based on 10½ Years' Experience with 1300 "Completely-Automatic" Heating Installations

By Eugene D. Milener

Assistant Superintendent, Fuel Sales, Consolidated Gas, Electric Light & Power Company of Baltimore. Chairman, Committee on Specifications of Central Gas Heating Equipment, American Gas Association.

Enterprise Steam and Hot Water Co., Heating Contractors.

Typical Groups of Dwellings in Baltimore Heated Entirely With Manufactured Gas.

THE progress that has been made in meeting the very real demand for automatic house-heating has brought new problems in its wake. There is no doubt that automatic house-heating has come to stay and that it will grow much faster in the future than it has in the past.

What are the conditions that must be met in supplying completely-automatic heat? Is it merely installing a device that will help with the stoking, or possibly installing a thermostat without a clock, relying upon the owner to arise in a cold house early enough to turn the heat on? I hardly think so. Completely-automatic heat means only one thing and that is a heating plant that turns its fire on in the morning, maintains an even predetermined temperature during the day and then turns the fire off at night. Anything short of that is a compromise, and compromises always leave something to be desired.

BALTIMORE THE FIRST CITY TO OFFER MANUFACTURED GAS FOR HOUSE HEATING

It has been just ten and one-half heating seasons ago that the luxury of completely-automatic house-heating was first offered to the property owners of a large city. True, natural gas house-heating was a fact in many cities, but there was always the

scare of a shortage during the cold weather when heat was most needed. The Gas Company in Baltimore at that time put in the first low gas rate designed to secure house-heating business in bulk. Much water has flowed under the bridge during that ten and one-half years, but one fact has been brought out in strong relief and that is, a demand for entirely automatic house-heating exists and can be met, viewing it from both financial and mechanical viewpoints.

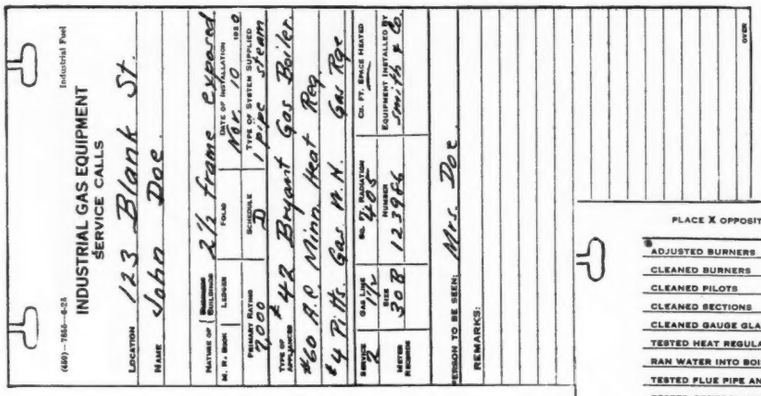
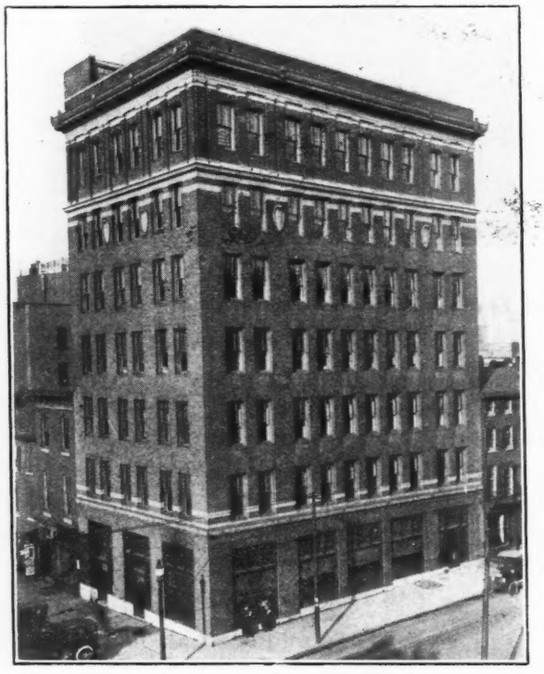

INDUSTRIAL GAS EQUIPMENT
SERVICE CALLS
Industrial Fuel
LOCATION 123 Blank St.
NAME John Doe
NATURE OF BUILDING 2½ frame expsd.
DATE OF INSTALLATION Mar 10 1926
TYPE OF SYSTEM SUPPLIED Vapor steam
TYPE OF APPLIANCES #42 Bryant Gas Boiler
#60 A.O. Minn. Heat Reg.
4 Pitts. Gas M.N. Gas Rgr
No. BURNERS 2
GAUGE 20
METER NUMBER 30B 123964
Cu. FT. SPACE HEATED
EQUIPMENT INSTALLED BY Smith & Co.
PERSON TO BE SEEN: Mr. Doe
REMARKS:
OVER

Fig. 1. Typical Handbook Sheet for Unsolicited Service Calls.

Below—Reverse of Unsolicited Service Call Handbook Sheet.

PLACE X OPPOSITE WORK DONE	SERVICE CALL NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	CALL NO.	DATE	SERVICE MAN'S SIGNATURE
ADJUSTED BURNERS	X																	1	7/10	G.F.H.
CLEANED BURNERS																		2		
CLEANED PILOTS	X																	3		
CLEANED SECTIONS																		4		
CLEANED GAUGE GLASS	X																	5		
TESTED HEAT REGULATOR	X																	6		
RAN WATER INTO BOILER	X																	7		
TESTED FLUE PIPE AND DRAFT	X																	8		
TESTED CONTROL VALVES	X																	9		
EXAMINED INSTRUCTION CARDS	X																	10		
TESTED SUPPLY OF GAS	X																	11		
																		12		
																		13		
																		14		
																		15		
																		16		
																		17		
SPOKE TO CUSTOMER ABOUT EQUIPMENT	X																			

Over 1700 central gas house-heating plants have been installed in Baltimore and over 1300 are now actually in use. The remaining 400 were discontinued for a variety of reasons, chief of which were changing neighborhoods (influx of negroes and foreigners), buildings torn down, residences turned into cheap apartments and financial reverses of some owners.



Charles T. King & Co., Heating Contractors.
For Ten Years This Building Has Been Heated With Manufactured Gas. (Baltimore Optical Company).

SERVICING OF PLANTS OF SUPREME IMPORTANCE

At first, it was thought that the servicing of gas heating plants would not present any particular problems, but after the first couple of dozen plants were in operation, it was realized that this phase of the business was going to be of supreme importance. An analysis of the subject confirmed this conclusion. A satisfactory completely-automatic gas house-heating plant requires a number of things. First, a good boiler or furnace, or good burners skillfully installed and adjusted. Second, a properly-designed heating system of ample capacity. Third, a good heat regulator with a reliable and accurate clock. Fourth, an unfailing supply of gas, and fifth, a competent service organization available as long as the plant is in use. Persons buy completely-automatic heating to relieve themselves of all manual and mental effort in connection with heating their properties. The relief from manual effort is obtained if the first four requirements are fulfilled, but it is only by means of a service organization that an owner can rest assured that he will have an evenly-heated house all winter.

READINESS TO SERVE MOST IMPORTANT FACTOR IN SERVICING

Service divides itself into two phases—readiness to serve and actual work in connection with the equipment being serviced. Of the two, it is not amiss to state that the first is the more important; and the more difficult to furnish. Unlike the automobile, the owner does not bring his heating plant into a garage for adjustment and leave it until a mechanic is available to fix it. In the case of the heating plant, the mountain must go to Mahomet and must be ready to go whenever called, because no matter how important service on other equip-

George R. Morris Organization, Architects.

As Far as the Eye Can See, These Houses Have Been Heated with Manufactured Gas for Eight Years.

(Clover Hill Road, Baltimore).

ment may seem, no house can be without heat 24 hours in winter.

Now who is going to stand ready at all times to give this service? There can be but one answer to that question and that is the organization that gets a steady income from the heating plant. Is it the boiler, burner or heat regulator manufacturer? No, because he gets only one fair profit at the time he sells the equipment. Is it the heating contractor who installs the boiler, burner or heat regulator? Again, no, because he secures only one profit and that is when the plant goes in.

The concern selling the fuel burned, and that concern only, must stand ready at all times to furnish service. Its income is continuous and must be sufficient to pay for being ready when called upon. Fortunately, gas companies are in a position to answer service calls promptly, and, based upon years of experience in servicing automatic water heaters, industrial gas appliances, etc., it was not long before the Baltimore company had a separate crew ready to handle this task.

ACTUAL WORK OF SERVICING NOT DIFFICULT

The second phase, that is, doing the work once the man arrives on the premises, is not difficult, merely training men to diagnose trouble promptly and surely and teaching them how to make repairs and adjustments. The house-heating crew in Baltimore consists of four men and a foreman, and two cars are assigned to their use. Calls of whatever nature are answered promptly during working hours because the men keep in touch with the office by 'phone. Night and holiday calls are worked equally as promptly by the regular gas emergency men, who are on the job all night.

If trouble develops that they cannot remedy, they communicate immediately with the house-heating service foreman, in whose home the company keeps a telephone. He issues instructions to the emergency man or sends for one of his own men to go to the job. The important thing is that regardless of the trouble which has developed, no delays in restoring heating service are countenanced; day, night or holidays make no difference.

SERVICE FREE OF CHARGE IN BALTIMORE

This service is absolutely free of charge, except when parts are used, for which a charge is made. When a contractor makes an installation according to specifications, he knows that he will not have to make many back calls explaining and adjusting details—irritating calls that are not important in themselves—which take up much valuable time in the aggregate. One of the chief obstacles which makes contractors hesitate in putting in automatic and semi-automatic heat is the experience of so many of them in having to spend their profit for service. They can afford to make repairs when a charge is made, but they cannot afford to maintain a vigilant organization ready to answer calls 24 hours a day and for which the customer expects to pay nothing.

(*Continued on Page* 78)

(88)—C359—15-24 REPAIR, ADJUSTMENT OR COMPLAINT C. G. E. L. & P. Co. OF BALTO.

LOCATION 123 Blank St PHONE

NAME John Doe DATE ISSUED 3/30/26

REPAIR ADJUST Thermostat needs regulating

IF MATERIAL IS USED HAVE AGREEMENT SIGNED

REPORTED BY	BY MAIL PHONE PERSONAL	RECEIVED BY	TIME RECEIVED	PHONED TO	DATE AND TIME
Cust.		BM	10 a		

METER DATA

SIZE	MAKE	COMPANY'S NO.	INDEX

REPORT OF WORKMAN

DATE 3-31-26 TIME 9 45 AM

SIZE OF SERVICE 2 SIZE OF HOUSE PIPE 1½

SIZE AND MAKE OF RANGE SIZE AND MAKE OF W. H.

Cleaned points of thermostat & explained to customer.

GENERAL SERVICE DEPT. OVER Frank Jones WORKMAN

Fig. 2. Trouble Call Ticket.

USUAL NATURE OF SERVICE CALLS

Experience has shown that service calls fall into several classes. Some people make a convenience of free service and make unnecessary demands upon the service man's time. Proper demonstrations, patience and the exercise of tact generally reduce these to a minimum. Burner and valve trouble is easily overcome because of the simplicity of gaugeless atmospheric burners. Heat-regulator trouble requires close adjustments and fine workmanship. Clock trouble constitutes a large percentage of the latter class. Many oil-burner installations are put in without clocks, but the gas industry, realizing its promise of entirely automatic heat, almost without exception advocates clocks on thermostats. In Baltimore, immediate service is given by keeping a number of extra clocks, motors and thermostats always on hand. Exchanges are made, the removed instruments are repaired and then placed in the special stock maintained solely for the purpose of making exchanges —another vital link in the readiness-to-serve chain.

SPECIAL CALLS MADE IN LATE SUMMER AND IN MIDWINTER

But service does not end with answering trouble calls. True, trouble shooting is necessary when any mechanical equipment is left unattended. The more complicated a device is, the more trouble calls that will originate from it. To render a complete service, two unsolicited calls are made on each job each year, one in the late summer to see that everything is ready to start when needed, and the other during the cold weather when the plant is operating at full load. In many cases, these unsolicited calls represent the entire year's service. These calls are recorded on the handbook sheet shown in Fig. 1 and the inspector is required to record each thing done in the space provided. Trouble calls are recorded on a separate ticket, Fig. 2, a duplicate being retained in the office until a complete report comes in on the original, which is then filed.

ASSURANCE OF CONTINUED SERVICE

The fact that houses in Baltimore have been automatically heated with gas for ten consecutive heating seasons proves conclusively that gas heating is entirely beyond the experimental stage.

Insulation Value of an Air Space, and Heat Transmission Through Double-Glass Windows

ONE of the ever-present problems in insulating is to determine the value of an air space. Air, when not in motion, is a very good nonconductor and in this State (Minnesota) the theoretical value of an air space as an insulator should be in direct proportion to its thickness. Unfortunately, however, the air does not remain quiet, but as soon as heat is applied, convection or eddy currents are set up. These convection currents increase as the width of the air space is increased until a point is reached where the effect of the convection currents equals or over-balances the resistance of the air to conduction, and the greater part of the heat is transmitted across the air space by convection.

The maximum effective width of an air space is undoubtedly different for different materials, and will depend upon the condition of the surface and its temperature. The position of the air space will also affect its value. A horizontal space with the heat applied to the under side would not be as good an insulator as would the same space with the heat applied to the top. A thorough study of this factor and its effect on insulated wall construction would be extremely valuable.

A series of experiments which have been made at Minnesota to determine the best spacing for double-glass for windows may be of interest in this connection. In making these experiments the hot box was used, and tests were made on both one thickness and two thicknesses of double-strength glass.

HEAT LOSSES THROUGH DOUBLE GLASS

No. of Thicknesses of Glass	Spacing Inches	Air Temperatures Deg. Fahr., 1 in. from Glass Surface		Mean Temp.	Transmission Constant K
		High Side	Low Side		
1	0	80.1	+ 4.0	42.1	0.887
2	⅛	77.5	— 10.3	43.9	0.708
2	¼	80.6	— 11.5	46.0	0.594
2	⅜	80.1	— 15.2	47.6	0.573
2	½	80.3	— 14.3	47.3	0.495
2	⅝	78.9	— 13.7	46.3	0.487
2	¾	79.5	— 14.3	46.9	0.471
2	1	80.5	— 1.3	40.9	0.488
2	1¼	79.8	— 10.8	45.3	0.494
2	2	81.5	+ 0.2	40.8	0.494
2	2½	80.5	+ 0.2	40.4	0.457

When the two thicknesses were used, the space between the surface was varied from ⅛ in. to 2½ in., and the tests made under still air conditions. The test areas in which the air had free circulation were 3 ft. square and the air temperatures were taken 1 in. from the outside surfaces. The average temperature on the high side of the glass was 80° F. and on the low side 8° F.

While there is some variation in the results of these tests, it appears that the best condition is reached at about ¾ in. spacing. From this point up to 2½ in. there seems to be but very little difference. This would indicate a constant for a double glass of slightly less than 0.5. If, however, the effect of air motion over the surface is taken into consideration, the same as for single glass, the constants will be 0.55, a reasonable constant to use in practice.—*From a paper by Professor F. B. Rowley, professor of mechanical engineering and director of the experimental laboratory, University of Minnesota. Presented at A.S.H. & V.E. semi-annual meeting, Lexington, Ky., May, 1926.*

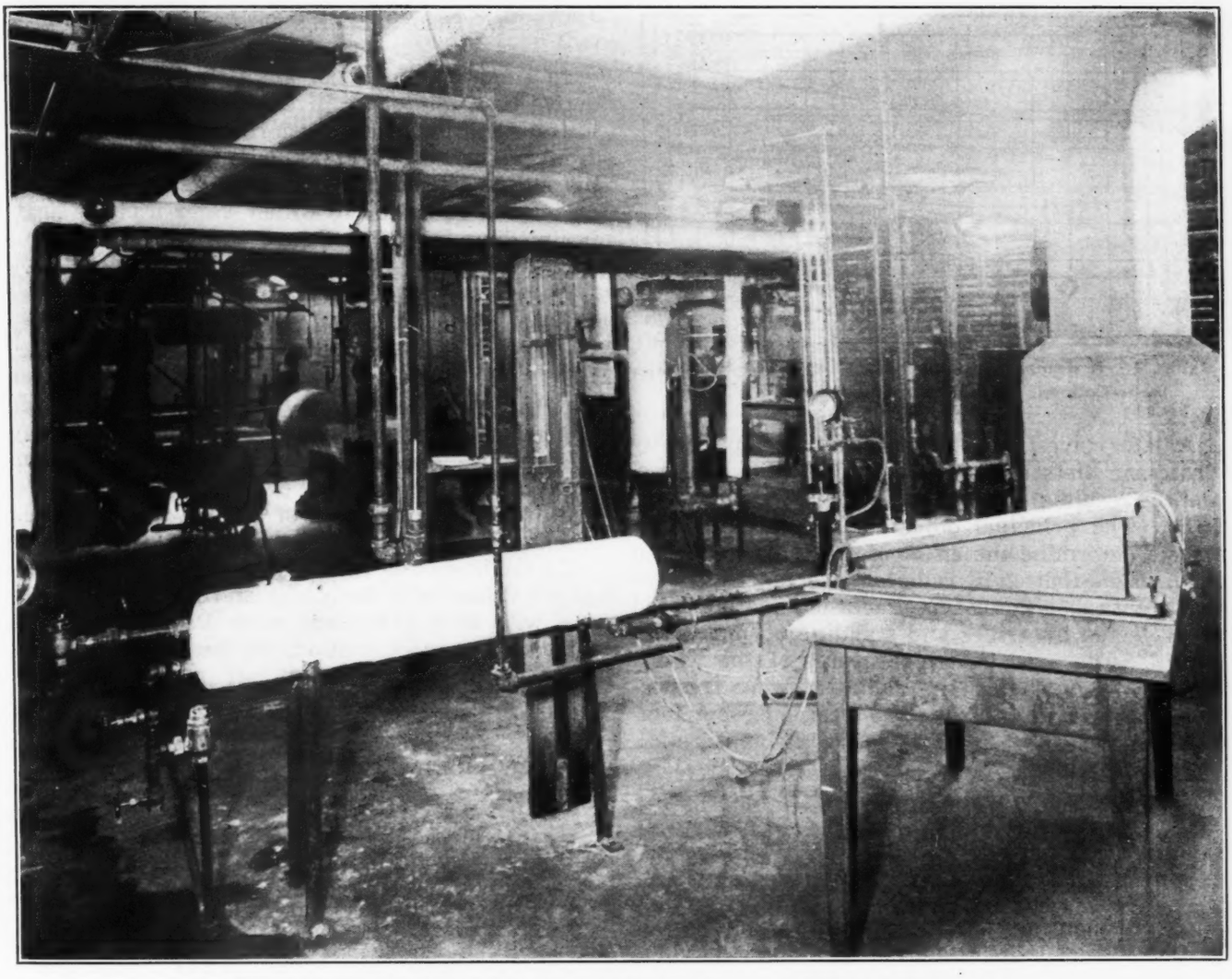


Fig. 3. Lower Portion of Experimental Heating System and Venturi Manometer

Dissipation of Heat by Cast-Iron Water Radiators*

Recent Tests Which Show the Fallacy in the Use of Comparatively Small Pipes and the Superiority of Two-Pipe Over One-Pipe Water Heating Systems

By F. E. Giesecke, Ph.D.

Professor of Architectural Engineering and Director, Engineering Experiment Station, University of Texas.

THE earliest reported tests, to determine the rate of heat dissipation by cast-iron water radiators, were made by Professor Rietschel. They are described in *Gesundheits-Ingenieur*, 1896. In discussing this investigation, Professor Rietschel states that he found a very great variation in the value of k with the variation in the velocity of the water through the radiator, and that he had to use very low velocities in order to secure high temperature drops through the radiator and that it is to be expected that the values of k existing in practical installations may be somewhat higher than those found in his experimental apparatus. (Vol. 19, p. 332.)

* This article, in slightly different form, is a reproduction of Chapter V of a thesis, prepared by Professor Giesecke at the University of Illinois, in partial fulfillment of the requirements of the degree of Doctor of Philosophy in Engineering, in the Graduate School of the University of Illinois.

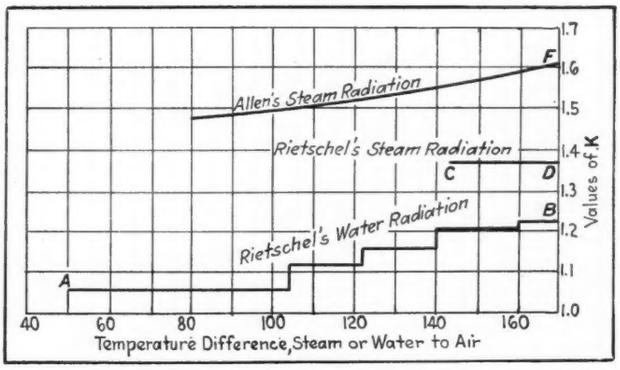


Fig. 1. A Comparison of k Values for a Ten-Section, Three-Column, 38-In., Surrounded by 70° F. Air.

A later investigation was conducted, partly by Professor Rietschel and partly by Doctor Brabbee, and the results published in *Gesundheits-Ingenieur*, 1911. The principal object of this investigation was to determine the effect of inclosing grilles on the heat dissipation by radiators. A few tests were made with hot-water-type radiators, not inclosed or protected by grilles and standing 60 mm. from a wall. The average temperatures of the water, entering and leaving the radiator, were, respectively, 176° and 140° F.; the average room temperature was 68° F. The following values of k were determined:

For 3-col., 1270-mm. radiator, k = 1.14
2-col., 1250-mm. radiator, k = 1.29
3-col., 650-mm. radiator, k = 1.25
2-col., 630-mm. radiator, k = 1.43

In commenting on these results, the author states: "From these tests one finds that the value of k, for a 3-col. radiator, is about 10% lower than that of a corresponding 2-col. radiator. Also, that the effect of the radiator height is about 10%. The values of k were not reduced to an equivalent average value because that would have obliterated the results of the test." (Pp. 813-14.)

The value of k for a 38-in., 3-col. radiator, determined by interpolating between the values given above for the 1270-mm. and the 650 mm. radiator, is 1.20. This value of k corresponds to a temperature difference of 90° between the temperature of the water flowing through the radiator and that of the surrounding air.

The values of k, adopted by Professor Rietschel and published in the *Leitfaden*, fifth edition, for a 3-col., 38-in. radiator having more than six sections, are shown in Fig. 1.

The highest value of k published by Professor Rietschel for a 3-col., 38 in. water-type radiator is 1.24; it applies when the average water temperature in the radiator is more than 176° F. above that of the air surrounding the radiator. Professor Rietschel's corresponding value of k for a low-pressure steam radiator is 1.37, or about 10% higher than that for a water radiator under like conditions. A similar relation exists between Professor Rietschel's values of k for 1-col. and 2-col. radiators and for radiators lower than 38 in. for water and steam radiation, respectively.

PROFESSOR ALLEN'S DETERMINATIONS

In America, Professor John R. Allen was more active than any other investigator in the study of heat dissipation by cast-iron radiators, but it seems, from published data, that Professor Allen devoted his entire attention to steam radiation and made no tests of radiation in which water was the heating medium.

A general and comprehensive review of the work of Professor Allen and other investigators was published in the *Journal* of The American Society of Heating and Ventilating Engineers, December, 1921. The data are published in tabular form so that the heat dissipation by the various types of radiators, under the various conditions which may arise in practice, can be easily determined. From these tables, the line E F of Fig. 1 was plotted so as to represent the value of k for a 10-sec., 3-col., 38-in. radiator, when surrounded by 70° F. air.

To facilitate the comparison of Professor Rietschel's values of k for water and for steam radiation with each other and with Professor Allen's values for steam radiation, all three sets of values are shown in Fig. 1.

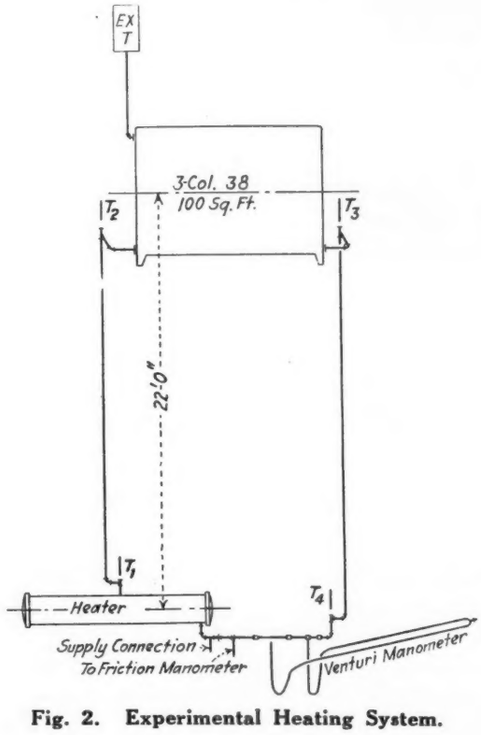


Fig. 2. Experimental Heating System.

EXPERIMENTAL DETERMINATION OF THE HEAT DISSIPATION BY WATER RADIATION

To determine the value of k for a cast-iron radiator, when the heating medium within the radiator is water, a number of tests were conducted by Professors F. E. Giesecke and V. S. Day with the elementary heating system shown in Fig. 2, which had been erected, for this purpose, in the Mechanical Engineering Laboratory of the University of Illinois. This system consists essentially of a heater, in which the water was heated by means

of a steam coil, a 20-section, 3-col., 38-in. water radiator, the connecting pipe line with four thermometers to measure the temperature of the water, a venturi meter to determine the velocity of the water, and an expansion tank.

The radiator was placed in the upper part of the laboratory and provided with a temporary floor and wall so as to produce, as nearly as possible, the same conditions which obtain when a radiator is located in a room, in so far as they affect heat radiation and heat-carrying air currents. The heater and venturi meter, and the general arrangement of the apparatus are shown in Fig. 3. The venturi meter was calibrated carefully so that, knowing the temperature of the water and the reading of the venturi manometer, the rate of flow through the meter could be determined very accurately.

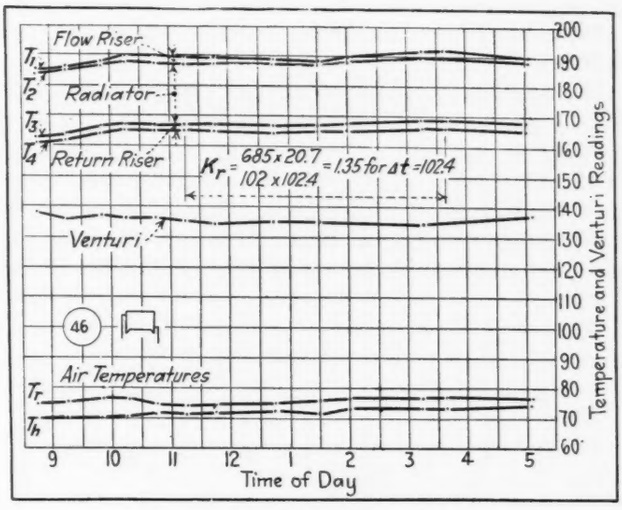


Fig. 5. Record of Test—No. 46

OPERATION OF EXPERIMENTAL SYSTEM

In using this installation to determine the rate of heat dissipation of the radiator, it was found that the system operated as follows: Before the test was begun, the system contained water having a temperature which was practically uniform throughout and approximately equal to that of the air in the laboratory; as a result of this nearly uniform temperature, there was practically no circulation of the water in the system.

When steam was turned into the coils of the heater, the water surrounding the steam coils was heated rapidly, and began to move through the flow riser into the upper part of the radiator. At the same time cold water was flowing from the lower part of the radiator through the return riser into the heater. For some time, the flow riser was filled with warm water while the return riser contained cold water; there was, consequently, a very great temperature difference and correspondingly large pressure head and high velocity of circulation.

After all the cold water had been removed from the radiator, the temperature of the water in the return riser increased gradually, and as the temperature of the water entering the heater rose, the temperature of the water leaving the heater also rose; this process continued until the average temperature of the water in the radiator had reached such a state that there was no further increase in the temperature of the water leaving the radiator. When this condition had been attained, and if other conditions remained constant, that is, if the heat communicated to the water by the steam and that dissipated by the radiator remained constant and equal to each other, the system operated in a uniform manner and the values of k determined during such a period of operation are correct values for use in designing heating systems. Any values of k, determined either while the radiator is "heating up" or while it is "cooling down" are not suited for that purpose; the former values are too high and the latter are too low.

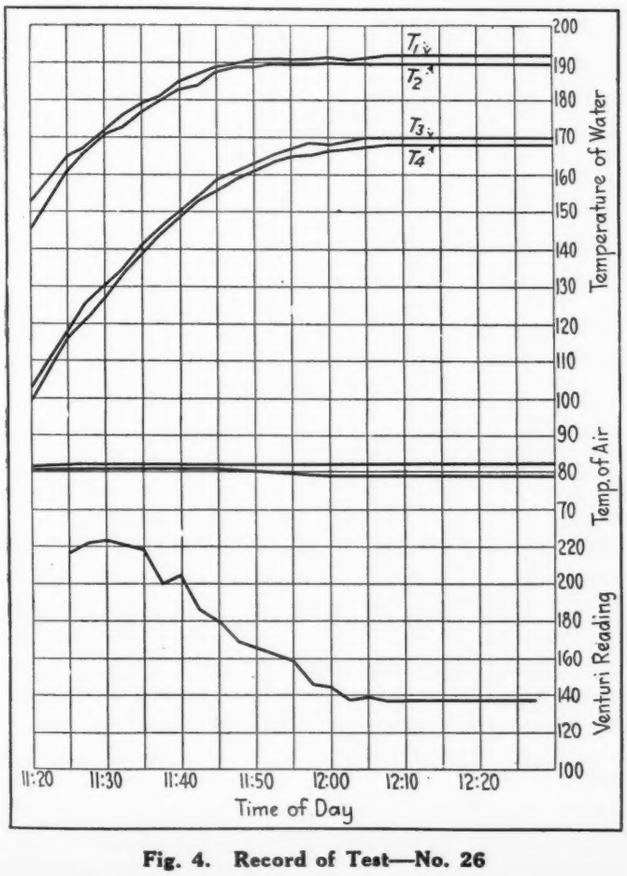


Fig. 4. Record of Test—No. 26

Fig. 4 shows the record of Test No. 26, conducted December 19. It is evident from the graph that at 11:20 a. m., when the first readings were taken, the water was leaving the heater at 154° and entering the radiator at 146°. The difference of 8° does not represent the temperature drop in the flow riser, but is the result of non-uniform operation of the system. It is also evident from the graph that the water was leaving the radiator at 102° and entering the heater at 100°, the difference between the average temperatures of the water in the flow and return risers being, thus, about 50°.

It is also evident that the temperature in the two risers continued to change gradually until about 12:10 p. m., when a state of equilibrium had been

attained. This state was maintained for several hours.

An examination of the venturi reading record in Fig. 4 shows that the water was circulating with its highest velocity at 11:30 a. m., that the velocity of circulation gradually decreased after that time; that it attained its minimum value at about 12:10 p. m., and remained at that minimum value during the period of uniform or steady operation of the system.

Reference to the venturi calibration curve shows that the rate of circulation was about 875 lbs. of water per hour at 11:30 a. m. and about 690 lbs. per hour during the period of steady operation.

These two rates of circulation represent, respectively, the following velocities:

$$\frac{875 \times 166.9}{3600 \times 61.20} = 0.66 \text{ ft. per second}$$

$$\frac{690 \times 166.9}{3600 \times 60.38} = 0.53 \text{ ft. per second}$$

The value of k, for this test, is found as follows: From the test records we find that at 12:05 p. m. water was flowing through the radiator at the rate of 685 lbs. per hour and that the temperature drop through the radiator was 20.7°; the total heat dissipated was 685 × 20.7 or 14200 B.T.U. per hour.

The radiator was rated 100 sq. ft., but the thermometers, which were used to determine the temperature of the water flowing into and out of the radiator, were placed in tees at the heads of the two risers and each was separated from the radiator by two pieces of 1-in. pipe and one elbow; the total length of pipe was 1 ft. 5 in.; the area of the outer surface of the two elbows and of the 2-ft. 10-in. length of 1-in. pipe is equivalent to 2 sq. ft. of radiator surface, hence, the total heat dissipating surface is 102 sq. ft.

The heat dissipated, per square foot, is 14200/102, or 139 B.T.U. per hour. The mean temperature of the water in the radiator was 180.7° and the temperature of the air surrounding the radiator was 82°; the temperature difference was 180.7 — 82 or 98.7°; the heat dissipated was 139/98.7, or 1.41 B.T.U. per hour, per square foot of radiator surface, and per degree temperature difference between the water in the radiator and the surrounding air. The value of k is, therefore, 1.41.

By the same method the following additional values of k were found for this test:

$$\text{At 1:12 p. m.:} \quad \frac{675 \times 19.7}{102 \times 99} = 1.37$$

$$\text{At 2:17 p. m.:} \quad \frac{687 \times 20.5}{102 \times 99.3} = 1.38$$

$$\text{At 3:12 p. m.:} \quad \frac{680 \times 20}{102 \times 99.8} = 1.33$$

The second and third values are practically alike; the first value is considerably higher than the second or third, and the last one is considerably lower.

It is probable that the system was still heating up when the first value was determined and that it had begun to cool down when the last value was determined.

It is safe to assume that 1.37, for a temperature difference of 99°, is the most accurate value of k secured from this test. This value of k, namely 1.37, is the average of the four determined, and will be accepted as the correct one for this test.

TWO GROUPS OF K-VALUES

Two series of tests were conducted in the manner just described. In the first series the flow riser was connected to the lower tapping of the radiator; in the second series it was connected to the upper tapping.

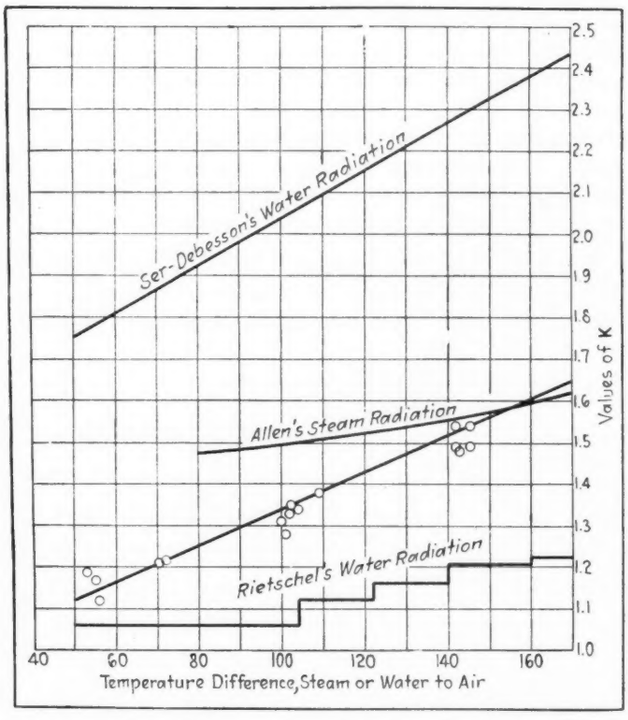


Fig. 6. Values of k from Second Series (Top Connection), Compared with Other Data

Test 26, shown in Fig. 4, is one of the first series.

Test 46, shown in Fig. 5, is one of the second series.

Of a considerable number of values of k determined during this investigation, those shown in the following tables are considered the most accurate.

In order to be able to study the variation in the values of k found in these two series of tests in the best possible manner, the values of the second series are shown in Fig. 6 and those of the first series in Fig. 7. In both figures other data are also shown, for the purpose of comparison. Both figures will be discussed after having explained a peculiar difference which was found to exist be-

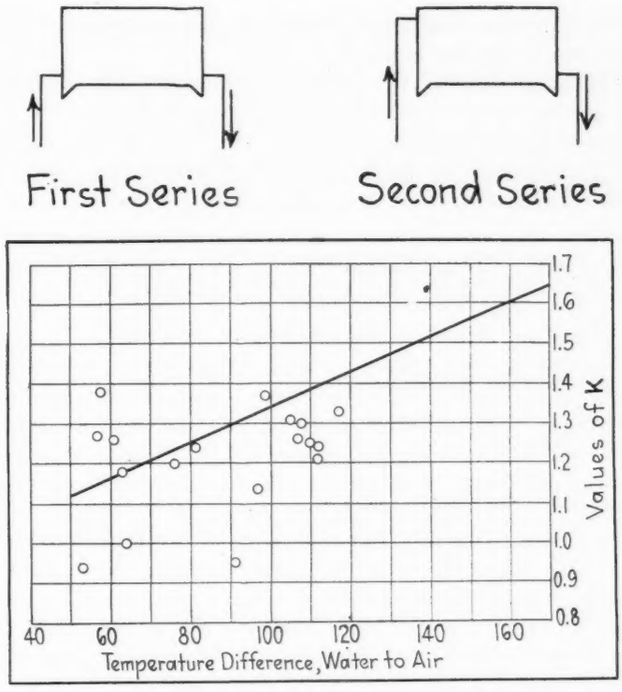


Fig. 7. Values of k for Both Series. (Points Are for First Series and Line for Second Series)

tween the temperatures of the radiator surface during the two series of tests.

SURFACE TEMPERATURE OF WATER-TYPE RADIATOR

To study the emission of heat by the radiator and also the circulation of water in the radiator, six thermo-couples were attached to the radiator at points shown in Figs. 8 and 9, in such a way as to measure the temperature of the radiator surface. In attaching the thermo-couple wires to the cast-iron radiator sections, great difficulty was experienced in attempting to drill small holes into the cast-iron because the metal was so hard that the small drills broke before penetrating to any considerable depth. The method adopted was to drill a hole about 1/10-in. in diameter, almost through the metal wall of the radiator, and to fill that hole with solder into which the small holes for the thermo-couple wires could be drilled very easily. This method was simple and effective.

By means of the thermo-couples, the temperatures at the six points of the radiator surface were observed during several tests and the fluctuations of the temperatures during the progress of the test were observed and recorded.

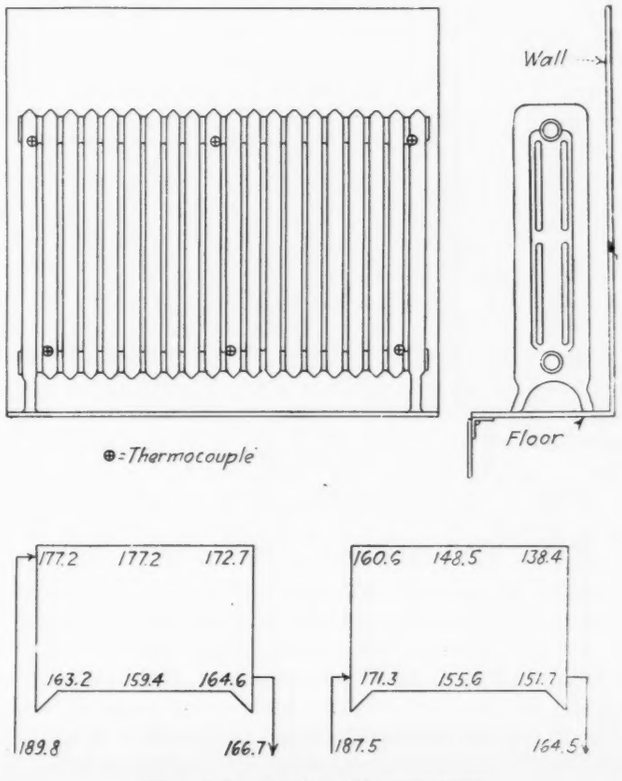
The temperatures shown in Figs. 8 and 9 are typical of the surface temperatures of the particular radiator tested.

Fig. 8 shows the temperatures which obtained when the flow riser was connected to the upper tapping. It is evident that in this case the hot water distributes itself fairly evenly along the upper portion of the radiator, then moves vertically downward to the lower portion of the radiator, and from there moves toward the return riser. It should be noted from Fig. 8 that when the average temperature of the water in the radiator was 178.3°, the average temperature of those portions of the radiator surface to which the thermo-couples were attached was 169.1° or 9.2° cooler than the water within the radiator.

Fig. 9 shows the temperatures which obtained when the flow riser was connected to the lower tapping. It should be noted that, in this case, when the average temperature of the water within the radiator was 176.0°, the average temperature of those portions of the radiator surface to which thermo-couples were attached was only 154.4° or 21.6° cooler than the water within the radiator. This greater difference between the recorded surface temperature and the water temperature, no doubt, resulted from a difference in the path taken by the water in flowing through the radiator.

When the flow riser was attached to the bottom radiator tapping, the hot water, no doubt, moved vertically upward through the middle columns of the radiator and then distributed itself from the middle columns through the outer columns. If thermo-couples had been attached to the middle columns of the radiator they would, no doubt, have shown higher temperatures than those found on the outer columns.

Since the middle column of a 3-col. radiator is less efficient, as a radiator, than the two outer columns, it may be expected that the values of k will be lower for the bottom than for the top connection (in a 3-col. radiator), and since the surface temperatures recorded in Fig. 9 do not show a definite direction of flow of water, as do those in Fig. 8, we may expect that the currents in the radiator are more variable when the hot water enters at the bottom than when it enter at the top,



Figs. 8-9. Surface Temperatures

TABLE I

FIRST SERIES: FLOW RISER CONNECTED TO LOWER TAPPING

No. of Test	Date of Test	Temperature Difference	Value of k
22	12 — 12	53	0.94
25	12 — 15	91	0.95
26	12 — 19	99	1.37
27	12 — 19	81	1.24
28	12 — 19	76	1.20
29	12 — 19	64	1.00
30	12 — 26	57	1.27
31	12 — 27	63	1.18
32	12 — 27	61	1.26
33	1 — 8	107	1.26
34	1 — 8	105	1.31
35	1 — 9	108	1.30
35	1 — 9	112	1.24
35	1 — 9	110	1.25
44	1 — 16	112	1.21
45	1 — 18	117	1.33

TABLE II

SECOND SERIES: FLOW RISER CONNECTED TO UPPER TAPPING

No. of Test	Date of Test	Temperature Difference	Value of k
46	1 — 22	102.4	1.35
47	1 — 23	70.3	1.21
47	1 — 23	72.0	1.22
48	1 — 25	56.0	1.12
48	1 — 25	53.0	1.19
48	1 — 25	55.0	1.17
49	1 — 25	100.1	1.31
50	1 — 25	102.0	1.33
51	1 — 25	109.3	1.38
51	1 — 25	101.9	1.28
51	1 — 25	104.2	1.34
60	2 — 6	141.9	1.54*
60	2 — 6	143.0	1.53*
60	2 — 6	145.9	1.54*

*Values 60 were determined by operating the heating system under pressure. This was accomplished by attaching a mercury column to the air-vent tapping of the radiator.

and that there will be a greater variation in the values of k, determined in successive tests.

Both expectations are realized in the results shown in Tables I and II and in Figs. 6 and 7, as may be seen by a comparison of the two groups.

A study of Fig. 6 shows that the value of k, within the range of this investigation, can be represented quite well by a straight line. It is also evident that the slope of this line is different from the general slope of the curve plotted from Professor Allen's tests of steam radiation. A comparison of the two lines shows that, for temperature differences of about 160° between the heating medium and the surrounding air, the heat dissipated by water-type radiators is about the same as that dissipated by steam-type radiators but that, for small temperature differences, the heat dissipation by water-type radiators is considerably less than by steam. The reason for this difference, no doubt, is that for the small temperature differences the motion of the water through the radiator is very slow and hence the protecting, colder film of water, next to the inner surface of the radiator wall, is thicker or at least is a better insulator than that which exists during a more rapid circulation of the water in the radiator.

It is probably incorrect to represent the values of k for water radiation by straight lines. It is likely that the values of k for steam and for water radiation should be represented by curves which approach a common asymtote.

PRACTICAL APPLICATION OF THE VARIATION OF K-VALUES

The fact that the efficiency of water radiation, as reflected by the values of k, decreases very rapidly as the difference between the temperature of the water in the radiator and that of the surrounding air decreases, makes it highly desirable to design water heating systems so that this temperature difference be maintained as large as possible. It is, therefore, a mistake to design a heating system with comparatively small pipes which necessarily require a large temperature drop through the system to secure circulation and consequently produce smaller temperature differences for the radiators than would exist if the same system were installed with larger pipes.

For the same reason, it is better to design water heating systems as two-pipe systems, in which all radiators receive hot water direct from the heater than to design them as one-pipe systems, in which the same water flows through more than one radiator before returning to the heater.

In the two preceding statements regarding the superiority of large pipes over small pipes and that of a two-pipe system over a one-pipe system, the deciding factor was the efficient use of radiator surface and the resulting reduction of the size of the system and the lowering of the first cost of the installation.

Improper Grading of Runouts A Frequent Cause of Trouble

Improper grading of runouts to radiators in fireproof buildings is a source of much annoyance. Under these conditions, if the trap is bad enough, all the water in the system can be drawn out in buckets from an air valve on the tenth floor. Frequently the architect has allowed too small a fill above the structural slab in which the fitter is supposed to run his pipes. Perhaps the grading was right in the beginning, but contraction and expansion and perhaps settlement have changed conditions and caused traps. Sometimes the radiators can be blocked up enough to remove the traps, or shorter nipples installed, without tearing up the floor construction, but often it cannot be done so simply.

Fortunately for this condition, builders are going more and more to the use of reinforced concrete, without floor fill at all, and making provision in the spaces between the beams of the ceiling below for the radiator connections. In such cases there is usually no excuse for a fitter failing to get sufficient grade in his connections to take care of any reasonable contingency.—H. C. RUSSELL.

This is the seventeenth lesson (concluded) of The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 17 (Concluded)

By Ara Marcus Daniels

The following factors are involved in problems relating to the flow of steam in pipes:—the weight of steam flowing, expressed in pounds per minute or in pounds per hour; the length of the pipe, usually expressed in feet; the initial pressure of the steam, in pounds per square inch; the final pressure of the steam, in pounds per square inch; the drop in pressure between the initial and final supply points; the velocity of flow of the steam, in feet per second or feet per minute; and the diameter of the pipe, expressed usually in inches.

Formulae, charts, and tables are useful in solving problems involving the flow of steam. An example of each will be presented in turn.

FORMULA FOR STEAM FLOW

A formula recognized as authoritative is known as Babcock's (G. H. Babcock) and involves all of the factors enumerated above, modified by a coefficient determined experimentally. The use of a formula in calculating flow of steam is, at its best, laborious, but it is well, where time will permit, and especially when studying the subject, to check results, obtained otherwise, by the formula.

APPLICATION OF BABCOCK'S FORMULA

To Determine the Quantity of Steam Flowing through a Pipe under Definite Conditions—PROBLEM—How many pounds of steam will be delivered per minute through 225 ft. of 3-in. pipe if the initial pressure is 10.3 lbs. gage and the final pressure is 8.3 lbs. gage?

SOLUTION:

First: Subtract the final pressure from the initial pressure and get the pressure-drop in pounds per square inch.

$$10.3 - 8.3 = 2 \text{ lb. pressure drop}$$

Second: Add 14.7 lbs. to the initial pressure and get the initial pressure in pounds per inch, absolute.

$10.3 + 14.7 = 25$ lbs. per square inch, absolute.

Third: Add 14.7 lbs. to the final pressure and get the final pressure in pounds per square inch, absolute.

$8.3 + 14.7 = 23$ lbs. per square inch, absolute.

Fourth: Determine the mean absolute pressure by adding one-half the difference between result SECOND and THIRD to the final pressure, absolute.

$$(25 - 23) \div 2 = 1 \text{ lb.}$$

23 lbs. + 1 lb. = 24 lbs. as mean pressure, absolute.

Fifth: Note the weight of 1 cu. ft. of steam at mean pressure, absolute. See steam table for 24 lbs. absolute pressure, 1 cu. ft. steam weighs 0.0590 lbs.

Sixth: Note the actual inside diameter of the pipe in inches. 3-in. pipe, 3.068 in. diam.

Raise this quantity to the fifth power.

$3.068 \times 3.068 \times 3.068 \times 3.068 \times 3.068 = 271.8$

Seventh: Multiply result FIRST by result FIFTH by result SIXTH.

$$2 \times 0.0590 \times 271.8 = 32.$$

Eighth: Add 3.6 to the inside diameter of pipe as noted under SIXTH. 3.6 plus $3.068 = 6.668$.

Ninth: Divide result EIGHTH by inside diameter of pipe.

$$6.668 \div 3.068 = 2.18$$

Tenth: Multiply result NINTH by length of pipe in feet.

$$2.18 \times 225 = 490.$$

Eleventh: Divide result SEVENTH by result TENTH and take the square root of the quotient.

$$32 \div 490 = 0.0653$$

Square root of $0.0653 = 0.256$

Twelfth: Multiply result ELEVENTH by 87 and obtain the pounds of steam per minute.

$$0.256 \times 87 = 22 \text{ lbs. per minute.}$$

Work Problems S-2-13, S-2-14

To Determine the Pressure Drop when a Given Quantity of Steam is Flowing through a Given Pipe.

PROBLEM:

Determine the drop in pressure through 225 ft. of 3-in pipe when 25 lbs. of steam is flowing per minute. Initial pressure equals 10.3 lbs. gage.

First: Multiply the value for quantity of steam in pounds per minute by itself.

$$25 \times 25 = 625.$$

Second: Multiply result FIRST by length of pipe in feet. $625 \times 225 = 141{,}000$.

Third: Add 3.6 to the inside diameter of pipe.

$$3.6 + 3.068 = 6.668$$

*Copyright, 1926, Ara Marcus Daniels.

Fourth: Divide result THIRD by the inside diameter of pipe.

$$6.668 \div 3.068 = 2.18$$

Fifth Multiply result SECOND by result FOURTH.

$$141{,}000 \times 2.18 = 307{,}000.$$

Sixth: Raise the inside diameter of the pipe to the fifth power.

$$3.068 \times 3.068 \times 3.068 \times 3.068 \times 3.068 = 271.8$$

Seventh: Multiply result SIXTH by the weight of 1 cu. ft. of steam at initial absolute pressure. This must be used since average pressure cannot be obtained. For 25 lbs., absolute, weight of 1 cu. ft. = 0.0613.

$$271.8 \times 0.0613 = 16.6$$

Eighth: Divide result FIFTH by result SEVENTH.

$$307{,}000 \div 16.6 = 18{,}500$$

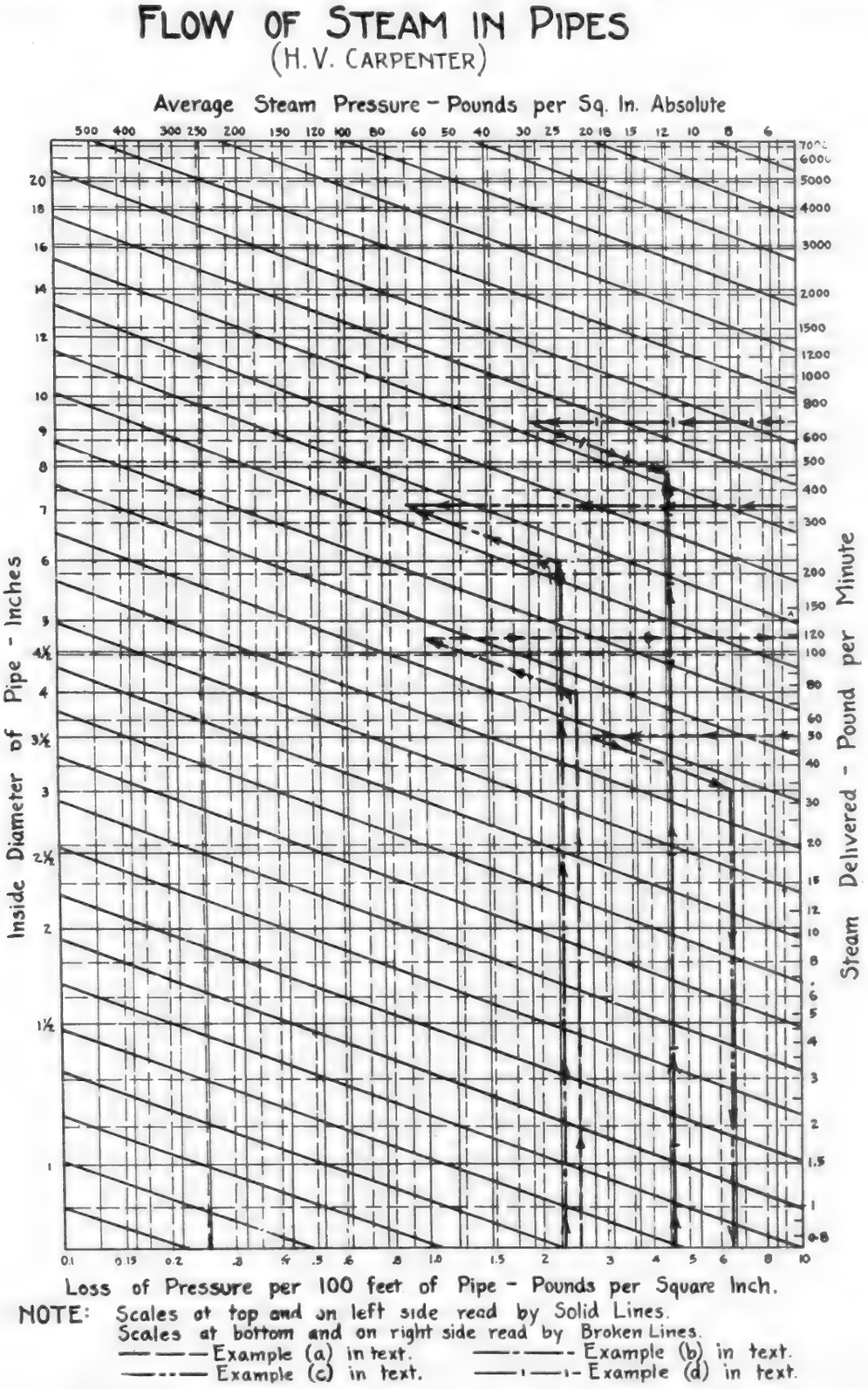

FLOW OF STEAM IN PIPES
(H.V. CARPENTER)
Average Steam Pressure – Pounds per Sq. In. Absolute
Inside Diameter of Pipe - Inches
Steam Delivered - Pound per Minute
Loss of Pressure per 100 feet of Pipe - Pounds per Square Inch.
NOTE: Scales at top and on left side read by Solid Lines.
Scales at bottom and on right side read by Broken Lines.
Example (a) in text.
Example (b) in text.
Example (c) in text.
Example (d) in text.

Fig. S-2-10—"Chart for Determining Factors Affecting the Flow of Steam in Pipes."

Ninth: Multiply result EIGHTH by 0.0001321 and obtain pressure drop in pounds.

$$18{,}500 \times 0.0001321 = 2.44 \text{ lbs.}$$

Work Problem S-2-15, S-2-16

CHART FOR FLOW OF STEAM IN PIPES.

The chart Fig. S-2-10, prepared originally by Prof. H. V. Carpenter, shows the relation between size of pipe, average pressure, drop in pressure, and weight of steam passing in pounds per minute.

APPLICATION OF CHART.

(a) To determine the weight of steam in pounds per minute that will be delivered through a 4-inch pipe at an average pressure of 60 lbs. absolute, through 325 ft. of pipe with a pressure drop of 8 lbs.

SOLUTION:

Drop per 100 ft. $= 8 \div 3.25 = 2.46$ lbs., say 2.5. Follow up the 2.5 point on bottom to intersect the 4-in. line from the left; turn down and running parallel to the inclined lines, intersect the 60-lb. point line from the top; turn horizontally to the right, follow over and read about 120 lbs. of steam per minute.

Work Problem S-2-17.

(b) To determine the average absolute pressure required in order that a 6-inch pipe will deliver 350 lbs. of steam per minute through 225 ft., with an allowable pressure drop of 5 lbs.

SOLUTION:

Drop per 100 ft. $= 5 \div 2.25 = 2.22$ lbs., say 2.25. Follow up the 2.25 line from the bottom to intersect the 6-in. line from the left; turn and continue upwards parallel to the diagonal lines until a horizontal line from the 350 point on the right is intersected. This point lies between the 60 and 80 lines from the top. Estimate this at about 70 lbs. absolute as required.

Work Problem S-2-18

(c) To determine the drop in pressure when a 3-in. pipe is delivering 50 lbs. of steam per minute through 75 ft. under an average absolute pressure of 20 lbs.

SOLUTION:

Follow over horizontally from the 50 point on the right to intersect the 20 line from the top; follow down diagonally and intersect the 3-in. line from the left; follow vertically down from this last point and read a pressure drop of 6.3 lbs. in 100 ft. For 75-ft. length, multiply 6.3 by 0.75 and read 4.73 lbs. drop.

Work Problem S-2-19

(d) To determine the size of pipe required to deliver 700 lbs. of steam per minute through 75 ft. of pipe under an average absolute pressure of 30 lbs. per square inch, with a total pressure drop of 3.5 lbs.

SOLUTION:

Drop for 100 ft.; $3.5 \div 0.75 = 4.57$ lbs., say 4.5. Erect a perpendicular line from 4.5 line at the bottom; follow over horizontally from the 700-lb. point on right to meet 30 lbs. line from top; follow diagonally and intersect the vertical line up from 4.5. This intersects slightly below the 8-in. line from the left so that an 8-in. pipe is required.

Work Problem S-2-20

TABLE FOR FLOW OF STEAM

One of the most convenient tables ever presented for this purpose was prepared by R. V. Frost for the American Society of Heating and Ventilating Engineers *Guide*, and is herewith included as Table S-2-1. Results are obtained from a formula differing but slightly from those as calculated by Babcock's formula.

This table consists of four columns marked respectively Columns 1, 2, 3, and 4. By the proper use of the values given in each column, the quantity of steam flowing or any one of the various quantities may be determined by simple multiplication or division when four of them are known or assumed.

TABLE S-2-1

FLOW OF STEAM IN PIPES

FACTORS

PRESS. LOSS OZ.	COL. 1 FACTOR	PIPE DIAMETER INSIDE	COL. 2 FACTOR	STEAM PRESS. GAGE	COL. 3 FACTOR	PIPE LENGTH FEET	COL. 4 FACTOR
1	2.175	1	0.522	0.0	0.193	20	2.240
2	3.076	1¼	1.177	0.3	0.195	40	1.580
3	3.767	1½	1.828	1.3	0.201	60	1.290
4	4.350	2	3.709	2.3	0.207	80	1.120
5	4.863	2½	6.109	5.3	0.223	100	1.000
6	5.328	3	11.183	10.3	0.248	120	0.912
7	5.754	3½	16.705	15.3	0.270	140	0.841
8	6.152	4	23.630	20.3	0.290	160	0.793
10	6.878	4½	32.098	30.3	0.326	180	0.741
12	7.532	5	43.719	40.3	0.358	200	0.710
14	8.138	6	69.718	50.3	0.388	250	0.632

ADAPTED FROM A.S.H.V.E. GUIDE '24-'25

Since water in low-pressure steam lines, condensation in covered pipe and roughness in commercial pipe will cause a reduction in steam flow as calculated by the formula, the value as obtained by using Table S-2-1 should be reduced 20%. The table may be used as follows:

To find the quantity of steam that will pass through a pipe of known diameter and length when the gage pressure and pressure loss through the pipe are known:

RULE: Multiply the quantities as taken from each column opposite the proper value by one another in turn and take 80% of the final product to obtain the quantity of steam in pounds per minute; multiply by 60 to express it in pounds per hour.

PROBLEM:

Determine the quantity of steam flowing through a 2½-in. pipe 80 ft. long when the gage pressure is 5.3 lbs. and the pressure loss is 1 oz.

(*Continued on Page 78*)

The Development of Atomization Methods for Oil Burners

Considerations Affecting Flame Characteristics and Economies Derived From Experiences of the Past

By S. D. Rickard

This article develops the fundamental theories presented in the April issue of THE HEATING AND VENTILATING MAGAZINE *and shows how the original type has been used in many applications: domestic, the U. S. Navy, industrial and commercial.*

IN a previous article describing the development of various types of devices for atomizing oil, we reached the conclusion that, other conditions being correct, an oil burner producing a short, hot flame will reduce oil consumption or insure a higher over-all boiler efficiency, and make it possible to develop more steam without smoke or soot with a limited fire-box area.

To design an oil burner that will produce the shortest possible flame, the most practical method seems to be not only to atomize the oil as finely as possible, but to discharge the oil into the furnace in the form of a whirling spray and discharge the air into the oil in such a manner that the air whirls in an opposite direction to the spray of oil or is "blasted" into the fine drops of oil.

The efficiency of this method proved itself many years ago in the application of oil burners to one of the first successfully oil-fired vessels in the U. S. Navy. This vessel was constructed on a guarantee to develop a certain speed without discharging smoke from the funnel, but upon completion of the vessel, it was found impossible to develop the guaranteed speed without smoke. Consulting engineers, who were called in, advised that the combustion chamber area was too small, forcing the flame into the boiler tubes and causing soot and smoke whenever it was necessary to burn enough oil to develop sufficient steam for full speed.

The shipbuilding company faced a considerable loss until a well known combustion engineer solved the riddle. The burners were of the old steam-atomizing type, but new nozzles were constructed, so designed that the mist of oil was discharged from the tips in a cone-shaped spray, whirling in a clockwise direction. Castings were then constructed to fit around these nozzles and to carry the air for combustion to the burner tips. These castings were fitted with guide vanes set at a sharp angle so that the air issuing from them was discharged, or "blasted," into the spray of oil in a whirling counter-clockwise direction.

It was then found that a still larger quantity of oil could be burned with an even shorter flame than was formerly the case; the vessel developed more than the guaranteed speed without smoke and the combustion engineer received a fee of $5000.00 for a few days' work.

Although the experience related above happened years ago on the Atlantic coast, it was not until many years later, or about 10 years ago, that a combustion engineer on the Pacific coast, re-discovered the same method of burning oil, quite by accident. The principle of burning oil was the same in each case, but the method of application entirely different. The experiments of this Pacific coast engineer resulted in a very successful oil burner, the atomizing nozzle of which is shown in Fig. No. 6.

It will be noted from this cut that a cup-shaped casting is rigidly attached to the end of a hollow extended shaft of an electric motor or steam turbine. A large-diameter stationary oil-tube passes through this hollow shaft and pours the oil in a small stream onto the inside surface of the cup. As the cup revolves at a speed of about 3600 R.P.M. the oil is thrown by centrifugal force from its rim in the form of a very fine spray or mist and whirled in a clockwise direction. The air necessary for combustion is furnished by a fan blower mounted

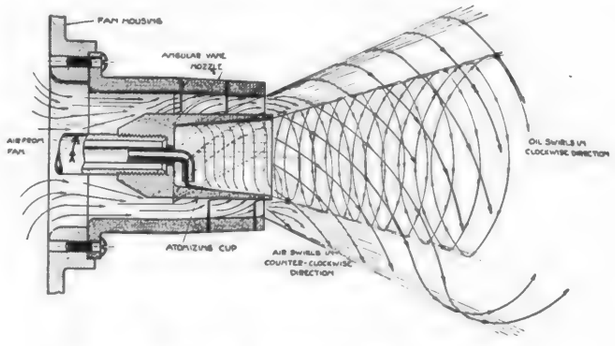


Fig. 6. Rotating Atomizing Oil Burner Nozzle

on the hollow shaft just behind the nozzle. This air is discharged at relatively high velocity through the angular vane nozzle surrounding the atomizing cup. The guide vanes discharge the air in a counter-clockwise direction into the already finely divided spray of oil, resulting in rapid mixing of oil and air and quickly completed combustion, which produces a very short, intensely hot flame.

Experiments with this burner have shown that in burning a definite quantity of oil per hour, the flame is about one third the length of the flame

produced when the air guide vanes are removed from the nozzle and the oil and air both whirl in the same direction. It has also been found that with vanes set at an angle of 55° the flame is much shorter and wider than with a nozzle having vanes set at an angle of 70°. Thus the flame may be adapted to any shape of fire box whether long and narrow or short and wide.

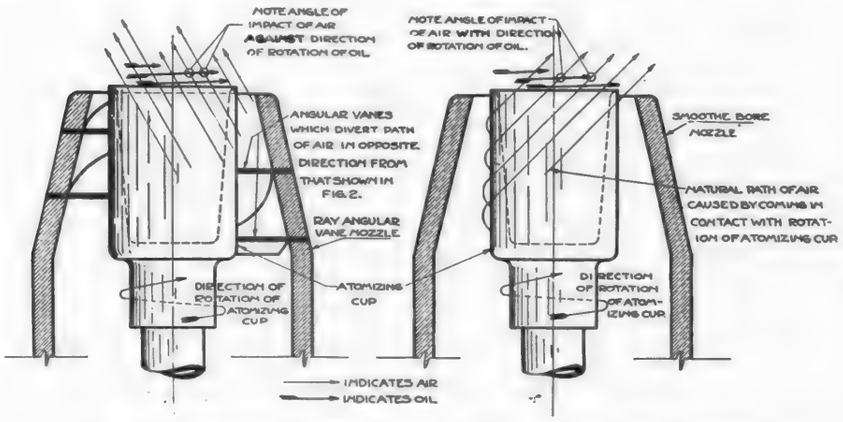

NOTE ANGLE OF IMPACT OF AIR AGAINST DIRECTION OF ROTATION OF OIL.
NOTE ANGLE OF IMPACT OF AIR WITH DIRECTION OF ROTATION OF OIL.
ANGULAR VANES WHICH DIVERT PATH OF AIR IN OPPOSITE DIRECTION FROM THAT SHOWN IN FIG. 2.
SMOOTHE BORE NOZZLE
NATURAL PATH OF AIR CAUSED BY COMING IN CONTACT WITH ROTATION OF ATOMIZING CUP
RAY ANGULAR VANE NOZZLE
ATOMIZING CUP
DIRECTION OF ROTATION OF ATOMIZING CUP
DIRECTION OF ROTATION OF ATOMIZING CUP
INDICATES AIR
INDICATES OIL

Fig. 7. Rotating Nozzle Showing Effective Air Guide Vanes.

It has also been found that burners designed on this principle may be built with equal efficiency in practically any size from one suitable for the smallest domestic heater to the largest power boiler.

An interesting installation of this type of burner for firing power boilers aboard ship was made in September, 1923, aboard the U. S. Navy Yard Tug "Navigator" at the Mare Island Navy Yard, California. A number of different makes and types of oil burners had been previously tried out on this vessel, but she still maintained her record for making smoke screens and difficulty in holding the required steam pressure.

For testing this new type of burner, the oil used was of about 14°-16° A.P.I. gravity and contained much foreign matter, having been pumped from other yard craft tanks in order to clean them out. The report states:—"It is doubtful if any other type of burner could have used this oil without clogging."

Previous to this installation the oil had been heated to a temperature of about 250° F. and discharged to the burners at a pressure of about 200 pounds per square inch.

With the new burners, the oil was pumped directly from the oil storage tank without being heated in any way (at a temperature of 68° F.) and under a pressure of only 25 lbs.

The result of this test, as well as the constant use of these burners aboard this vessel for over two years, showed that full steam pressure could be carried with the vessel under full speed without producing smoke, deposit of carbon or soot in the fire boxes, or clogging of the burners. There has been no expense for cleaning or upkeep of burners and an oil saving of approximately 52% has resulted.

The results secured by this method of atomizing oil aboard this vessel, as well as several other later installations aboard U. S. Navy vessels, led to a very thorough test last summer at the Fuel Oil Testing Plant at the Philadelphia Navy Yard and further tests are still being conducted.

One interesting discovery made during these tests was the fact that a large percentage of water emulsified with the oil failed to extinguish the flame or interfere with the operation of the burner in any way. It is the writer's belief that this is due to the centrifugal force of the revolving cup automatically separating the water and oil, due to their different specific gravities, right at the tip of the burner.

This method of atomizing oil has been applied to industrial annealing ovens where it was found that, due to a reduction in excess air formerly required, a considerable loss caused by scaling of the metal products was practically eliminated. Another large manufacturer of breakfast foods is successfully using this method of atomizing oil in large reel ovens where the food is cooked in the direct path of the gases.

Other methods of applying the principle of quickly combining the necessary oil and air for combustion have been developed by a number of combustion engineers.

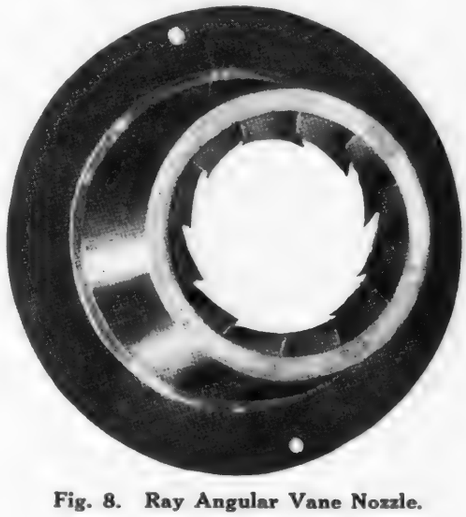


Fig. 8. Ray Angular Vane Nozzle.

There are a number of very satisfactory installations for firing power boilers and industrial furnaces where the old-fashioned nozzle-type burners, such as described in our previous article, are used; but the air for combustion is first preheated to temperatures as high as 800° F. When this stream of hot air is brought in contact with a stream of oil the viscosity of the oil is rapidly reduced materially, aiding in its atomization, and the mixture necessary for combustion is completed much quicker than would be the case with cold air under the same conditions. This results in a short, hot flame of high efficiency.

Although this method of preheating air has been in practical use in industrial plants for many years past, it has only, within recent years, been adopted by a few manufacturers of domestic oil burners.

Another interesting and successful method of atomizing oil, used for years in industrial operations, has been adopted by a number of designers of domestic burners. In this method the oil is given a whirling motion by guide vanes and discharged at relatively high pressure through a very small orifice in the tip of the burner. This produces a very fine, cone-shaped spray. The air is then discharged into this spray of oil. In some cases, guide vanes cause the air to whirl in the opposite direction to the path of the oil, while in other cases no guide vanes are used.

One manufacturer discharges the oil in a flat whirling sheet of oil with a counter current of air whirled in the opposite direction by guide vanes set in the burner nozzle, and another designer has combined the use of the mechanical spray with a blast of preheated air.

New Home-Study Course in Steam and Gravity Water Heating
Lesson No. 17
(Continued from Page 75)

SOLUTION:

Col. 1 × Col. 2 × Col. 3 × Col. 4 × 60 × 0.80 = lbs. of steam per hour or

2.175 × 6.109 × 0.223 × 1.120 × 60 × 0.80 = 159.31

Work Problem S-2-21

To find the size of pipe required to deliver a given quantity of steam a known distance from the boiler when the gage pressure and pressure drop are known or assumed.

RULE: Divide the quantity of steam in pounds per hour by the product of values from Col. 1 × Col. 3 × Col. 4 × 60 × 0.80.

Work Problem S-2-22

To find the boiler pressure needed to deliver at a required pressure a given quantity of steam through a pipe of known size and length.

RULE: Divide the quantity of steam in pounds per hour by the product of values from Col. 1 × Col. 2 × Col. 4 × 60 × 0.80.

Work Problem S-2-23

To find the pressure at which a given quantity of steam will be delivered through a pipe of known diameter and length for a given pressure at the boiler.

RULE: Divide the quantity of steam in pounds per hour by the product of values from Col. 2 × Col. 3 × Col. 4 × 60 × 0.80.

Work Problem S-2-24

The next lesson, to appear next month, will include the effect of pipe fittings, valves, etc., upon steam flow, pipe capacities, for steam heating, selecting pipe sizes for steam delivery and sizing pipe for one-pipe work.

Mechanical Equipment for a University Hospital

By P. E. Brender

THE new University of Michigan Hospital has recently been formally opened and dedicated. The building was started five years ago and represents a total cost of $3,850,000. It provides for 710 beds, of which 97 are in private rooms, 360 in 20 18-bed wards and the remainder in 2-bed, 4-bed and special rooms. With the old hospital as a convalescent ward, and other smaller buildings for special purposes a total capacity of 1100 beds is provided. The new building is nine stories in height with provision for four additional stories when needed. It contains 5,577,000 cu. ft., with 280,000 sq. ft. of floor area. Some conception of its size can be gained from a few items chosen at random from bills of materials used in the construction—8000 sash pulleys, 120,000 lbs. of sash weights, 1546 locks in sixteen different groups, with group master and grand master keys, 11,000 square yards of linoleum, 2970 window screens.

STEAM SUPPLIED FROM UNIVERSITY'S POWER HOUSE

The hospital is served from the university's power house with steam at 80 and 35 lbs. pressure, hot water and A.C. electric current at 2300 volts. Gas and cold water are supplied from the city mains.

The heating system is a two-pipe, up-feed supply and return vacuum system and required 80,000 sq. ft. American Radiator Company legless 2-col. and 3-col. radiation. Webster Sylphon traps are on all radiators. National Regulator Company regulation was installed throughout, requiring about 1000 thermostats. All steam supply mains, return mains and risers are covered with 1-in. 85% Carey's magnesia covering, the larger mains being double covered with 1-in. wool-felt. Medium-pressure steam at 55 lbs. is distributed throughout the building to supply operating-room radiation, sterilizers, blanket and solution warmers, etc. Condensation from these units is passed through Wright-Austin low-pressure traps.

Typical Ward in University of Michigan Hospital

DRY AIR FILTER FOR OPERATING-ROOM FLOOR

The operating-room floor is supplied by a fan with heated outside air passed through a Midwest air filter. These rooms and the autopsy amphitheater are the only ones supplied with heated outside air. From all wards, toilet rooms, utility rooms, treatment rooms and diet kitchens the air is exhausted by thirteen Sirocco fans, handling 141,400 cu. ft. of air per minute and requiring 63 electrical H.P.

General View of University of Michigan Hospital

Besides the main kitchen there are thirteen distributing diet kitchens, one internes' kitchen, one kitchen serving all private rooms, and one central diet kitchen—all together these contain facilities for feeding 1500 persons. All dish washers are supplied with hot water at 210° F.; two are also supplied with live steam. Including all types of equipment, approximately 1500 fixtures with sealed traps were installed.

A 60-ton American Carbonic Machinery Company's compressor, using CO_2 gas, furnishes the refrigeration. A 30-ton Kroeschell machine, moved from the old hospital, serves as a reserve unit. There are 37 refrigerators which are termed "reach-in" type and 21 "walk-in" type. The latter include special storage rooms for ice, milk, poultry, fish, meat, butter, eggs, vegetables, and fruit, an ice-cream hardening room, garbage room, and the morgue. All refrigerators and boxes are built of two 2-in. layers of cork, finished with plaster outside and mastic asphaltic base cement inside.

The cold medium is brine and all boxes and cold rooms are divided into two systems termed "high" and "low." The high system includes the first floor and everything above; the low system contains everything up to the first floor. The brine is circulated by two sets of duplicate Chicago pumps. All brine lines are covered with Armstrong cork covering. Direct expansion cools the ice-cream hardener, ice cream brine cooler, 64 200-lb. cans for ice making and a shell-type brine cooler for cooling brine on the high-pressure system.

The machinery room in the sub-basement contains the two compressors mentioned above, one 50 cu. ft. American Steam Pump Company compressor, two 100 G.P.M. Economy pumps for boosting hot water, two 500 G.P.M. cold water pumps—one from American Steam Pump Company, one from Allis-Chalmers Company—one 50 G.P.M. drinking water pump and one ice cream freezer, four brine-circulating pumps and one E. 20 duplex unit Nash-Jennings vacuum pump and receiver which pumps condensation back to the power house.

One Nash-Jennings vacuum pump provides vacuum for all operating rooms, two 25-gal. per hour stills furnish distilled water to all floors at a central position in the building.

There are nine elevators, twelve dumb waiters and one Gillis-Geoghegan garbage hoist.

The outstanding feature of the building is its magnitude—the enormous quantities of material required and the multiplicity of detail necessary in order to obtain economy in construction and operation. The completed structure embodies the ideas of the medical staff, the architect, and the university officials, supplemented and unified by two years of study on hospital construction by Dr. John H. Shepard, supervisor of plans for the university. It was the writer's good fortune to be employed by the architect's office during the final revision of plans. Through them he became Dr. Shepard's personal representative on the building during the construction of the mechanical details and was later selected as chief engineer of the hospital units. The architect was Albert Kahn, Inc., of Detroit.

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

MEMBER

National Publishers' Association
Associated Business Papers, Inc.
Audit Bureau of Circulations
National Trade Extension Bureau

VOL. 23 June, 1926 No. 6

Published Monthly at New York, N. Y., by the
HEATING AND VENTILATING MAGAZINE COMPANY

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GUSTAVE PETERSEN . Treasurer and Business Manager
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Subscription	$2.00 per year
Canada	2.50 per year
Foreign Countries	3.00 per year
Back Numbers	50 cents each

A SIGN of the times which many heating men are overlooking is the trend towards greater comfort and even luxury in the home and in its equipment. While it is true that home-owners are on the alert, as ever, to get the most for their money, they are becoming rapidly won over to the proposition that, in the long run, the best is usually the cheapest. Not only is the old cry of low cost losing its potency, but even economy of operation is passing, to some extent, as a criterion. The demand now is for convenience and service and this applies to no one item in home-building with more force than to the heating equipment. As one home-owner expressed it recently, "Give me something that will do away with the winter's grind of looking after fires and ashes and I'll pay the freight."

The oil-burner manufacturers are well aware of this trend and are pushing it for all it is worth. Even the gas men, whose opportunities for price competition with other fuels are still further removed, are going after the house-heating load with more confidence than ever and are painting an alluring picture of freedom from heating worries, with costs relegated far into the background. At the same time, a concerted movement on the part of the gas companies is bearing fruit in the form of special gas rates for heating which are closing the gap between gas and oil or coal.

UNTIL recently people generally have looked upon the heating of homes as a necessity which had to be borne. The main object was to make the home livable, rather than to secure the full comfort of mild outdoor weather conditions. If the oil and gas-burning interests have done nothing else than to awaken the American public to the luxury of heating, they have justified their activities. But they have done more. They have set the home-owner to thinking of his heating system as something to enjoy, instead of tolerate. Take, for instance, the matter of thermostatic control. The fact that it is an essential feature of oil and gas-burning systems has undoubtedly been a potent factor in bringing out its advantages in coal-fired systems as well.

When we leave the cellar we find the home-owner is paying more attention than ever to means for beautifying his rooms. To meet this demand manufacturers of radiator enclosures are putting out exquisite designs which are a marked advance over anything of their kind previously available. In the same connection, the movement we noted last month toward "invisible" radiators is part and parcel of the trend towards greater beauty and increased comfort in the home.

Finally, our up-to-date home-owner is getting to know the difference between good and poor heating systems and is insisting on better layouts, with first-class radiator valves, traps and air valves. Radio talks reaching vast numbers of people are acquainting them with the meaning of "certified heating," while the development of house insulating materials naturally has suggested the corollary, "Why not better heating systems?"

Along with vacuum sweepers, domestic mechanical refrigeration and the wide variety of electrical appliances for almost every conceivable use, house-heating apparatus appears definitely to have entered the class of equipment that is more than a necessity, often more than a comfort or convenience. It is rapidly assuming in every home its rightful place as the item to be given major consideration, second only in importance to the home itself.

A REMARKABLE spirit of co-operation has been displayed by oil-burner manufacturers in the plan outlined by THE HEATING AND VENTILATING MAGAZINE of last month, designed to eliminate loose sales-talk from oil-burner trade literature. A wide agreement has already been reached on a code of ethics covering this matter. In view of the generous attitude of the oil-burner manufacturers, it comes somewhat as a painful surprise to find the periodical of the hard coal operators, *Anthracite Coal Service*, frankly given over to propaganda against domestic oil burning, although the expressed purpose of this publication is "to give free engineering advice to those seeking information on the economical use of anthracite coal for heating and power purposes."

Heating Engineers Raise the Banner of "Controlled Ventilation"

How the Society is Meeting the Issue of Window Ventilation Told at Its Semi-Annual Meeting, Held in the Heart of the Blue-Grass Section of Kentucky

TO those who had never experienced Southern hospitality at its best, as well as to those who thought they knew all about it, the midsummer meeting of the American Society of Heating and Ventilating Engineers, in Lexington, Ky., May 26-28, set a mark that would be hard to equal and impossible to exceed. It was not alone in the way the comforts and pleasures of the attending delegates were anticipated at every turn. Even more delightful was the spirit of kindliness and welcome which was apparent on every side and which took form in many ways outside of the scheduled program. Private luncheon parties, with drives to such places of interest as Shakertown, lawn parties at typical Kentucky homes together with the outpouring of Lexington's feminine charm and beauty, all gave evidence of the genuineness of the city's welcome.

Dean F. Paul Anderson, of the College of Engineering of the University of Kentucky, who was to all intents and purposes the host of the meeting, had promised the members a treat, and as one visitor feelingly expressed it, "he more than fulfilled his promise." It came as a fitting climax that at the close of the meeting Dean Anderson's name was announced by the nominating committee as its choice for the office of president of the society next year.

Some indication of the way the society is meeting the challenge of the window-ventilation advocates was furnished in the reports of the plans now under way to make comparative tests of window-ventilated and mechanically-ventilated schools in Rochester, N. Y., during the coming winter and by the announcement of additional tests of schools in typical sections of the country representing moderate and extreme conditions in the way of mild and cold winter weather.

In connection with the window-ventilation movement, undoubtedly the keynote of the meeting was struck by Dr. J. E. Rush, of the University of Kentucky, who, in an address on "Rational Ventilation," declared that "we need controlled, conditioned air, just as we need controlled, conditioned milk or water."

In point of attendance, the meeting compared favorably with other summer meetings of the society, the total registration figures being 230.

Morning Session, May 26

President William H. Driscoll opened the meeting in the ballroom of the Hotel Phoenix, Wednesday morning. He presented Dean Anderson who, as host of the occasion, and looking the part in flannels, introduced Mayor Yancey of Lexington, referring to the fact that it was the same Yancey who in bygone years figured so prominently in football as Morgan Yancey, the famous halfback.

Ordinarily, said Dean Anderson, it was customary for the Mayor to send down the coroner or the corporation counsel to represent him at a convention and he pointed out that that was not the way they did things in Kentucky.

Mayor Yancey showed his familiarity with the heating industry and with the society's affairs by speaking of its organization and growth during the past 30 years. He cited the fact that one of the charter members of the society was in the hall—J. J. Wilson of Philadelphia—and the members interrupted the Mayor long enough to give Mr. Wilson a round of applause. Another charter member who was given a warm greeting was A. S. Mappett, of Philadelphia.

Two proposed amendments to the by-laws providing for the segregation of the membership into geographical zones and the establishment of a new classification of "regional" members to designate those belonging to a given section of the country aroused an extended discussion. The purpose of the amendments was to provide a more representative method of electing the society's officers. In effect it was understood that the amendments if adopted would mean that hereafter the society would function in a manner similar to the national government, with the chapters playing the role of States. Members of the nominating committee would be named by the different chapters, in some cases acting together, as the nominating committee comprises only five members.

While the general idea of the proposed amendments was approved, there was so much misunderstanding as to the way the proposed new by-laws would operate that it was finally voted to refer them to a committee to redraft them and report at a later session. Later President Driscoll appointed as this committee, John F. Hale, chairman; Roswell D. Farnham and E. S. Hallett. At the last session the committee's redraft of the amendment was adopted, providing for the election, by each chapter, of a member of the nominating committee.

A practical paper of direct interest to all was given first place on the technical program, under the title of "Humid Air as a Heating Medium." This paper was presented by the author, Foskett Brown, of Nashville, Tenn., and embodied a new idea in the form of a radiator valve admitting a mixture of steam and air to the heating system.

Humid Air as a Heating Medium

Mr. Brown has devised a clever method of so converting conventional steam heating systems that they may be used throughout a wide range of temperature conditions, securing economy of operation and ease and certainty of control where comparatively small quantities of heat are required. As Mr. Brown shows, this system is particularly adapted to the southern States, where

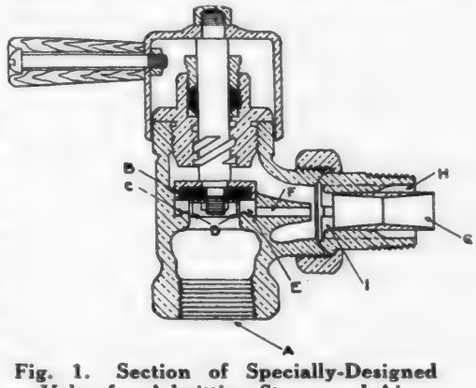


Fig. 1. Section of Specially-Designed Valve for Admitting Steam and Air to Radiator

the outside temperature may be quite low in early parts of the day, with a great rise in temperature in a few hours.

By means of a specially-designed metering valve of conventional size and installation characteristics, Mr. Brown converts an ordinary steam-heating system into one as flexible as a hot water system and as quick in action as a steam system. As is well-known, one of the features that characterize a water system of heating is the ability to operate it at low water temperatures whenever the demand for heat is small. Under

The Convention Party on the Campus of the

these conditions, with the water, say, at 120°, the radiator is effective throughout its entire area as it would be at full load, when the temperature may be 180°. Where steam is used as a heating medium and is throttled down, only a portion, and at that the upper portion, of the radiator is effective and its temperature is practically that of steam at the temperature corresponding to the pressure under which the system is operated.

It is obvious that more effective heating can be secured through the use of a medium, the temperature of which may be varied within wide limits and with which the entire radiator may be utilized at all times.

As Mr. Brown states:

"This problem has been solved as follows: As is well known, air in intimate contact with water absorbs it, and tends to become saturated with water vapor, and the higher the temperature of the air, the more moisture will be absorbed. This moisture does not exist as entrained water, but has actually been evaporated into vapor or steam, and as such has heat of vaporization or latent heat.

"This latent heat can be imparted to colder surfaces by condensation of the vapor, and it is evident, therefore, that saturated or moist air, humid air, would be suitable as a medium for heating with the ordinary forms of radiating surface, if proper provision were made to replenish the supply of vapor as it condenses. Such a medium could be maintained at any desired temperature, and, if so maintained, would have all of the desirable characteristics of water as a heating medium, with the added flexibility of steam, of heating and cooling quickly.

"Steam, when allowed to flow into a chamber containing air, tends to rise to the top of the chamber, due to its lower density, and will have the temperature corresponding to its pressure. This condition may be noted in a radiator of the hot water type. When steam is admitted with the ordinary type of admission valve it will heat the radiator to approximately its own temperature. If the pressure is well controlled and the valve partially opened, it will heat the radiator along the top of its loops while the lower portion remains cold.

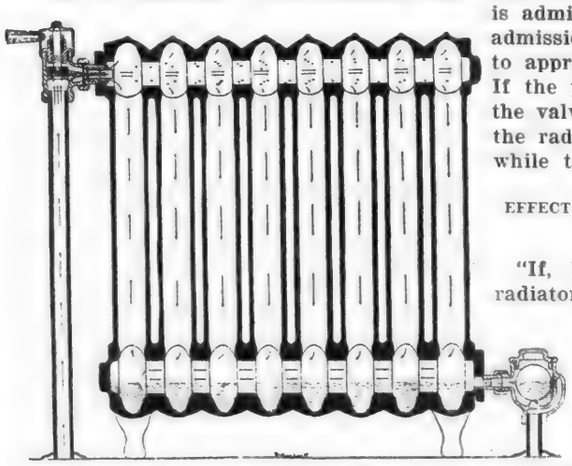


Fig. 2. Standard Water-Type Radiator Equipped with Air and Steam Mixing Valve

EFFECT OF INTIMATE MIXING OF STEAM AND AIR

"If, however, the contents of the radiator or chamber are agitated mechanically so as to mix intimately the steam and the air, the steam will be absorbed by the air, forming a humid mixture, or saturated air, at a lower temperature than that of the steam, and the mixture so formed will serve as a heating medium, the vapor or steam carried, condensing on the surface of the chamber or radiator. If steam is admitted as fast as the condensation occurs, the temperature of the humid mixture will remain constant. If more steam is admitted, the temperature will rise until a balanced condition is reached where increased heat losses due to radiation equal the heat furnished by the incoming steam. Likewise if the steam admission is restricted, the temperature will drop. By this process it is possible to obtain any desired temperature of the humid mixture from that of the original air content of the radiator, to that of the inflowing steam itself.

"It is evident that this process can be performed in the ordinary type of hot water radiator, or similar vessel, furnishing a suitable circuit for the circulation of the humid mixture by means of a propeller or fan, or other means, within the radiator, operated by a motor or otherwise, the steam being admitted at any suitable point through an orifice of variable size, or a regulating valve.

USE OF VENTURI TO SECURE MIXING AND CIRCULATING EFFECT

"It is known that steam even under very light pressure will generate a high velocity when dropping to a lower pressure, and when properly directed in the form of a jet forms a very powerful and effective mixing and circulating device, and will, while furnishing the necessary heat supply to maintain the required temperature of the humid mixture, also serve to generate and circulate the humid mixture so as to maintain a satisfactory uniformity of temperature throughout the radiator so constructed as to permit the circulation of its contents, as is the conventional hot water type radiator.

University of Kentucky After the Burgoo Picnic

"The new apparatus is designed to perform the functions described of admitting and regulating the steam supply to a radiator of the conventional hot water type, and, by the action of a jet of steam at high velocity through a venturi tube, to cause a generation of the humid mixture, and its effective circulation throughout the radiator, as well as a definite control of the temperature of the humid mixture. This apparatus provides a method of mechanically generating and circulating a humid mixture within the radiator, and controlling the temperature of the humid mixture, at any desired temperature, from that of the original air content of the radiator, to that of the steam itself.

"The device is designed to provide a method of heating by steam, by which, with steam at any pressure, radiators or similar vessels may be uniformly heated over their entire surface to any desired temperature, from that of the original air content to that of the steam itself. In the device is incorporated all of the apparatus necessary for the accomplishment of this purpose.

DETAILS OF MIXING VALVE

"Referring to the section of the valve (Fig. 1), steam is admitted at point A. When it is closed, the conventional valve disc B is closed against seat C, preventing the passage of steam to the radiator. As the handle is rotated counter clockwise the disc and metering slot sleeve D lifts vertically the area of the metering slot, a narrow slot in thin tubing increasing proportionally to the distance lifted. As the disc leaves the seat, steam is free to pass through the metering slot, into the annular jet chamber E, and thence to and through the jet F at high velocity.

"Leaving the jet the steam passes through the mixing chamber I, where the air within the radiator is intimately mechanically mixed with it, and through the venturi tube G, and thence into the radiator at a velocity sufficient to circulate mechanically the humid mixture within the radiator.

"The passage of the jetted steam at high velocity through the mixing chamber and venturi tube accomplishes an induced draft of air or vapor from the radiator, through the annular space H between the spud and the venturi tube, into the mixing chamber, where it is remixed with the steam supplied. It will be seen that the accurate control of the area of opening of the metering slot is effectually a variable area orifice, and when the output demand is small, a small opening of the valve will deliver the necessary temperature input, and likewise, as output demand increases, a larger opening will give the greater input necessary.

ACTION OF HUMID MIXTURE WITHIN CIRCUIT

"In the radiator section, Fig. 2, equipped with this valve, there is shown diagrammatically the action of the humid mixture within the circuit, the valve being shown four eighths open. Full opening is accomplished on seven eighths turn of the handle. The first four eighths are utilized for metering through the metering slots and the last three eighths for full opening when input demand calls for heating the radiator to the full temperature of the steam.

"It is observed that the jet of humid air leaving the venturi tube does not expand until it has passed through the first nipple of the radiator, and consequently, that the first loop is utilized for the induced flow of the humid mixture, from the lower portion of the radiator upward, and into the mixing chamber. There is a downward travel of the humid mixture in each succeeding loop and a reverse travel across the bottom connection of the radiator, accomplishing a thorough circulation, and corresponding uniformity of temperature.

"Even when full open, part of the steam, diverted through the jet, serves to circulate the steam throughout the circuit, improving the heating effect, as it is well known that the passage of a heating medium over a radiating surface is more efficient than the same medium lying inert against that surface.

"Summing up briefly, the new method of heating with humid air as a heating medium consists of the mechanical mixing of air and steam in the radiator, so as to form a humid mixture, in which the heating medium is the steam or vapor carried by the air, the continuous circulation of the humid mixture within the radiator, and the maintenance of the desired temperature, or variation of this temperature by the metering of the steam admitted."

In the discussion Charles F. Eveleth raised the point that modulation valves now on the market will accomplish the same end as Mr. Brown's valve. He asked how it was proposed to get rid of the air in the radiator, how such valves as those proposed would operate with a vacuum system so as to permit the withdrawal of air from the system, and what economy there could be in partially heating a radiator at steam temperature, as compared with heating the entire radiator surface at a lower temperature.

R. V. Frost contributed to the discussion by presenting a number of charts showing the results of tests on Mr. Brown's valve made at Mr. Frost's laboratory in Norristown, Pa. These tests, he showed, bore out the statements made as to the functioning of the valve although he was frank to admit that it was not clear that the valve would show any economy over the present systems.

In closing Mr. Brown said the new valve, when full open, operates like any other valve. It is only when partially closed that the inflow of air takes place. When connected with a vacuum system, the vacuum acts to increase the pressure at the inlet valve and the conditions are that the vacuum is greater in the radiator than in the return line.

On the economy feature, Mr. Brown said he could not account for this except on the basis that a radiator at a comparatively low temperature will not give such high air temperatures at the ceiling and will make it easier to heat a room. As a matter of fact, he said, tests had shown 25% more condensation with the older types of systems than with the same system equipped with his new valves. This could easily be possible if there were less differential in the room air temperature.

In presenting the next paper on "Development of the Art of Heating and Ventilating in Canada," the author, Professor L. M. Arkley, of Queens University, Kingston, Ontario, departed long enough from his text to extend an invitation to the society to hold one of its forthcoming meetings in Canada. In the meantime he proposed visits by individual members and outlined an automobile route that took in many of the plants and points of interest mentioned in his paper.

"An Experiment in Insulating a Home," by H. S. Ashenhurst and S. R. Lewis, was presented by Mr. Ashenhurst. This paper described the construction, equipment and operating data of the Ashenhurst residence in Chicago which was described in THE HEATING AND VENTILATING MAGAZINE for December, 1925, and March, 1926. Mr. Ashenhurst brought out many additional facts regarding the house and the heating economies effected. The lively discussion which followed showed the intense interest that is being taken in the use of building insulating materials.

Due to the fact that Professor F. E. Giesecke found it impossible to be present, his paper, on "Friction of Water in 90° and 45° Elbows," was put over until a later session.

Morning Session, May 27

Thursday morning's session was opened with a paper by Professor Frank B. Rowley, of the University of Minnesota, on "Some Results of Heat Transmission Research."

A question as to whether any of the tests of glass sash were made with the sash in a horizontal position was answered by the statement that only vertical sash was tested. Professor Rowley stated that there would be much difference in the results with sash set horizontally. Another question as to the temperature gradient of the material under test was answered by the statement that a uniform temperature gradient was obtained through the use of fan operating so as to keep the air moving. Sometimes, said Professor Rowley, it took two or three days to establish the heat gradient. This, he said, was due in some cases to the presence of moisture in the material being tested.

A dead-air space of ¾ in., it was brought out, is just as effective as any other width. In the tests reported the area of the materials was, in each case, about 3 ft. square.

RESEARCH SESSION

Before turning over the meeting to H. P. Gant, the new chairman of the Committee on Research, President Driscoll told of the plans which had been formulated since the annual meeting in Buffalo to thrash out the window-ventilation theory. Two schools in Rochester, N. Y., are under consideration in which to make a series of comparative tests of window and mechanical ventilation. Co-operation has been secured with the American Public Health Association and it is planned to start the tests next Fall.

It is probable that similar tests will be conducted in other cities and to this end co-operation has been obtained with other bodies, in addition to the A. P. H. A., including the New York State Commission on Ventilation, the National Education Association and the American Medical Association.

Each organization will appoint its own committee but they will act as a unit to be known as the "General Conference Committee." The society's central conference committee will be headed by Willis H. Carrier.

It is proposed first to determine the points in dispute in regard to methods of ventilation on which all can agree. After that the points on which there is disagreement will be taken up, and agreement sought at last on the character of the tests to be made.

Although it may not be possible to compose the differences now prevailing, Mr. Driscoll said it was reasonable to suppose that some of the difficulties could be ironed out.

Mr. Gant then took the chair. He reported the addition of two technical advisory committees, one on the rating of low-pressure heating boilers, of which Alfred Kellogg, of Boston, is chairman; and the other on chimney sizes for low-pressure heating boilers, of which J. R. McColl, of Detroit, is chairman.

Within a short time, he said, the Research Laboratory will begin sending out brief reports of the work being done as well as that previously completed, with the purpose of making all the Research Laboratory data available to the layman as well as to others who now find the data not adaptable for easy practical use.

Director F. C. Houghten stated that five major investigations are now under way at the Research Laboratory: (1) pipe sizes for steam heating, (2) leakage of air through walls, windows, etc., (3) effect of temperature, humidity and air motion on human beings at work and clothed, (4) radiator design, and (5) heat losses through building materials.

Mr. Houghten showed slides of the piping set-up with a riser connected to several radiators. With this set-up tests will be made with risers of different sizes, starting with a size lower than would be used in commercial work, so as to get a complete range. Charts of some of the preliminary test results were also shown.

Miss Margaret Ingels told of the air infiltration tests and emphasized the point that the investigation should continue over a long period. Brick, she said, does not change much in structure, but plaster changes materially, developing hair cracks through which air passes to an extent often felt by the hand.

R. V. Frost told of the work laid out for the tests on radiation. The direct radiator, he said, is now undergoing the most radical changes in 35 years. Condensation, he said, is no longer considered a true index of the heating effect of a radiator. To carry out the tests contemplated which will include investigations of radiation and convection effects of direct open and concealed radiators it is estimated that $15,000 will be required. The Boiler and Radiator Manufacturers' Association is to be represented on the advisory committee and negotiations are now being carried on to determine how far the association will go in financing the tests.

In answer to a question Mr. Frost stated that the tests will apply to all types of heating surface intended for use in direct heating. This will include the new type of heating units recently placed on the market.

Willis H. Carrier gave details of the tests going forward on temperature, humidity and air motion. The data now being procured, he said, will be especially applicable to theater cooling and will take in the items of the proportions of latent heat and of sensible heat given off by humans under such conditions. Claude A. Bulkeley brought out the fact that different indoor conditions are required at different seasons of the year. The body, he said, becomes accustomed to the different conditions of summer and winter. Mr. Carrier agreed with this, mentioning the fact that a temperature of 78° F. in the summer, with a relative humidity of about 45% was not uncomfortable, whereas in winter it was usual to maintain not over 72° F. with a slightly higher relative humidity.

C. F. Eveleth reported on the tests under way on pipe sizes. The data to

be obtained, he said, will be of interest and value, to all who have piping work to do and his committee is looking forward with much optimism to the success of the tests.

Two separate research papers were presented at this session, one on "Development and Characteristics of a Carbon Monoxide Recorder," by S. H. Katz, of the Bureau of Mines, Pittsburgh; and the other on "Work Tests Conducted in Atmospheres of Low Temperature in Still and Moving Air," by W. J. Connell, of Philadelphia, and C. P. Yaglou, of Boston.

Morning Session, May 28

At the opening of the Friday morning session, Professor Giesecke's paper on "Friction of Water in Elbows" was presented by R. V. Frost.

Thornton Lewis, president of the York Heating & Ventilating Corporation, Philadelphia, presented what proved to be one of the feature papers of the meeting on "Observing Warm Air in Circulation."

Observing Warm Air in Circulation

As a starting point, Mr. Lewis lays down the axiom that it is impossible to heat a building with absolute uniformity regardless of the amount of heat that may be developed within it. That is to say, the laws of Nature ordain that the air in our homes and commercial buildings will be warmer near the ceiling than at the floor-line.

As a corollary to this fact, it becomes evident that the average temperature in a room, taking the floor and ceiling line as extremes, is not necessarily an index to the effective heating of that room. In other words, heat may be delivered to a room in large quantities and yet fail to effect comfortable condition in the working zone because the heat is permitted to increase the ceiling temperature far beyond a desirable point, rather than to maintain the working zone at a comfortable temperature. Manifestly, this is a wasteful application of heat.

Mr. Lewis then referred to the research work of Dr. C. W. Brabbée and of F. R. Frost in showing the saving that may result from the proper designing and placing of radiators, so that the heating effect is more largely applied to the working zone. Mr. Lewis then stated that his own investigations and tests had led him to believe that by the use of unit heaters, properly designed and located, it is possible to save 15% to 30% of the fuel required when compared with direct radiation, power blowers or unit heaters improperly applied.

The investigations, upon which these conclusions have been reached, were largely based upon an elaborate visual study of the movement of warm air, made visible through the use of smoke bombs. As "still" pictures of smoke tests only told a part of the story, recourse was had to the motion-picture camera for checking, comparing and confirming the data already developed. An elaborate description of such a test appeared in THE HEATING AND VENTILATING MAGAZINE for March, 1926.

In conjunction with this photographic work, temperature determinations were made in various types of buildings, from which the diagrams presented by Mr. Lewis were compiled.

Mr. Lewis then formulated the following principles applying to the circulation of air:

1. That little energy is required to move a body of air horizontally through its own temperature stratum, as compared to the much greater energy required to move hot air downward against the resistance of a cold air stratum, or to move cold air upward against gravity into a stratum of less dense air.

2. That heated air or air warmed above the surrounding temperature, will follow its natural tendency to go upward unless controlled, and that it may be controlled by a maintained velocity sufficient to overcome natural effects.

3. That the cold air stratum lying along the floor of a building cannot effectively be removed and carried upward through a warmer air stratum to a point above the working zone except by the use of ducts or conduits, even though mechanical means be used to create velocity or pressure, or both.

4. That a cold air stratum may be moved horizontally from along the floor by mechanical means or stack effect, provided there is created a sufficient induced velocity in an enclosure carried down to, or near, the floor line.

5. That the B.T.U., or amount of heat secured from any given heating surface, increases as the velocity of the air over the surface increases. This is true within the limits of practical operation.

6. That the convection principle, or the circulation of heat-laden air, through the zone to be warmed, is essential to the most efficient warming of that zone.

7. That blasts of hot air moving at appreciable velocities within the working zone must be avoided in the design of practical heating systems.

To illustrate these principles and to demonstrate their verity, Mr. Lewis presented a series of diagrams and slides.

In commenting upon the general subject of unit heaters, Mr. Lewis said he expected to see this type of apparatus develop to the point where savings of 50% would be effected in the heating of industrial buildings. When we speak of heating a building, he said, we mean heating the air in that building. Another speaker suggested that a better definition would be the heating of the occupants.

Mr. Baetz, of St. Louis, a pioneer in the unit heater field and the designer of the original Baetz unit heater, said the conclusions reached by Mr. Lewis agreed with his often-expressed opinions and he congratulated the industry on recognizing the merits of what he termed a fan system which eliminated the use of distributing ducts. He favored the floor-mounted type of unit heater and declared the only advantage to be gained by suspending unit heaters overhead was the saving in floor space. However, it would pay, he said, to enlarge the floor space sufficiently to accommodate the units, as the economies effected in that manner would more than justify the cost of the extra construction.

Willis H. Carrier called attention to the fact that an important factor to be given consideration was that there was a decided difference between the way warm and cool air distributes itself. It should be kept in mind, he said, that Mr. Lewis, in his paper, refers only to warm-air distribution. With a similar distribution of cool air it is necessary to take precautions against drafts. Another point he made was that when air is admitted to a room it induces a flow of the air already in the room, producing an ejector effect, so that when we speak of moving a certain quantity of air in an enclosure, we are in reality displacing a much greater quantity of air. A haphazard method of distribution, he added, has small effect. What is needed is a systematized distribution.

There are two standard ways, he said, of distributing warm air. One way is to use small volumes with systematized distribution, at high temperatures and high velocities. With such a system a velocity of from 2000 to 3000 ft. per minute is not too high, the points of admission being along the top of the wall at one end of the room, directly below the ceiling. Care should be taken to arrange the system so that the air will flow to the other end of the room, where it descends and returns at about the breathing-line level.

The other method is to increase the number of units admitting air and to operate them with lower air velocities. It is always important to determine the relation between volume and velocity in either case.

Mr. Rowe, chief engineer of the American Blower Company, also discussed the paper. He said he was not fully convinced of the wisdom of using high outlet velocities. The heating of the individual, he said, is the vital thing and that must be kept in mind when we consider such factors as temperature, velocity, effect of height of room.

Claude H. Bulkeley expressed the opinion that the possibilities of unit heating had not been scratched as yet. He felt that it was destined to become the universal method of factory heating. Units with floor discharge tend to keep the air from rising. He expressed his belief that unit heaters would be used for unit air conditioning work.

In closing the discussion, Mr. Lewis cited a case where a building 346 ft. long had been successfully heated with a unit placed at one end. We can afford to enlarge our buildings, he said, to substitute unit heaters for either radiator or duct systems. In answer to one of the points raised as to whether the air travel followed that of the smoke in the rooms tested, he said this had been checked with thermometers and it had been found that the smoke took the same course as the heated air. He agreed with Mr. Carrier regarding systematized distribution but felt that the same result could be secured in, say, a long building, by placing the heater in the center of the room, and discharging the air towards each wall. This, he said, had the effect of dividing the room into four sections. The important thing is that the air currents must not cross each other. He also showed views to support his contention that if air is to be drawn down from the roof the heater inlet must be placed at a point near the roof.

THE RUSH PAPER ON "RATIONAL VENTILATION"

Judging from the comments of such men as J. D. Cassell, superintendent of school buildings of Philadelphia, and others, one of the most important papers ever presented to the society, was that of Dr. J. E. Rush, of the University of Kentucky, on "Rational Ventilation." The keynote of the paper was struck in the statement that "we need controlled, conditioned air, just as we need controlled, conditioned milk or water."

"To produce air so regulated," he said, "in respect to its quality, its carbon dioxide content, its moisture content and its motion, artificial means are absolutely necessary and open windows alone can never suffice. In cold weather especially, the open window does not provide for uniform distribution of properly-warmed air. Fans are absolutely essential in the ventilation of large rooms to keep the air in motion and to render it comfortable to persons in the room.

"The greatest need for study in the matter of ventilation is in the school room, and the financial investment for properly-designed, installed and operated air-conditioning equipment in the school is more than justified by the decrease of disease among the children. The diseases of the respiratory tract, chief among which is tuberculosis, are far more costly to the community than would be the ventilating system."

The control of factors in ventilation to produce clean, fresh air, free from dust and germs, such as the open air of the country is normally, in the congested living conditions which our urban civilization has created, the function of the ventilating engineer, said Dr. Rush, and through a careful study of the problem in the research laboratory, such results can and will be obtained, he believes.

The fault of ventilating engineering in the past has not been with the engineers, Dr. Rush said, but was due to the slow progress of investigation in this field by the medical profession, which has absolutely failed to derive positive data on the best atmospheric conditions for school rooms. It is also due to the poor operation of systems by the janitors who run them.

At the conclusion of his paper, on motion of Mr. Cassell, Dr. Rush was given a rising vote of thanks, accompanied by hearty applause.

Another paper which bore out the statement that "the best had been reserved to the last," was that of J. R. McColl, of Detroit, on "Heating and Ventilating a School without Direct Radiation."

Classroom Heating and Ventilating Without Direct Radiation

This paper traces the development of school heating and ventilating through the use of the blast system and the split system to the present time.

Speaking of the latter, Mr. McColl says:

"The split system, with its direct radiation for heating, makes it possible to warm classrooms without ventilation. In all probability, the great majority of mechanical ventilating systems for schools, as they exist to-day, are of this type, and unless they are in charge of conscientious engineers or under the control of thorough-going supervising engineers, the great tendency is to cut down on the use of the fan system and to operate the heating system only. Unfortunately, we are not as conscious of poor ventilation as we are of poor heating, and, consequently, the lazy or careless operating engineer can get by undetected, with poor ventilation if he has the split system. My observations lead me to believe that with this type of system, not more than half are giving real sanitary results, sometimes due to faulty design or installation, but almost always to poor maintenance and operation.

"When we see the overheated and poorly-ventilated classrooms and filthy conditions existing from basement to attic in such a large percentage of the split systems, it is not surprising that there has grown up such a strong sentiment for the open window and the geting away from the more complicated mechanical systems. I contend that operating engineers and their superiors are more to blame than any other one group for the sentiment which has grown up against mechanical ventilation for schools, and they are to be condemned as much for overheating as for poor ventilation."

INTRODUCTION OF PORTION OF AIR THROUGH WINDOW SILL

In describing the development of a blast system that is used in the newer Detroit schoolrooms and in those of adjoining cities, Mr. McColl says:

"In principle, it differs from the old type of blast system, in that a certain amount of the air is introduced through a slit in the window sill. This slit is about the thickness of a match and extends the full length of the window. This air is supplied from a shallow chamber below the window and its purpose is to break up the cool down currents of air already mentioned, the actual process being, according to smoke and thermometer tests, to mix with the downward currents, warming them and rolling with them across the classroom, approximately at breathing level, to the vents on the corridor side of the classroom. It took considerable testing to get the right volume and velocity for this air delivered through the window sills. The best results were obtained with approximately 20% of the air for the room delivered through the window slits and 80% from the two diffusers on the corridor wall.

ELIMINATION OF BASEMENT ROOMS AN AID IN DESIGN OF BLAST SYSTEMS

"The tendency in recent years to build schools without basement rooms, has aided the design of the blast system, where two chambers, one carrying tem-

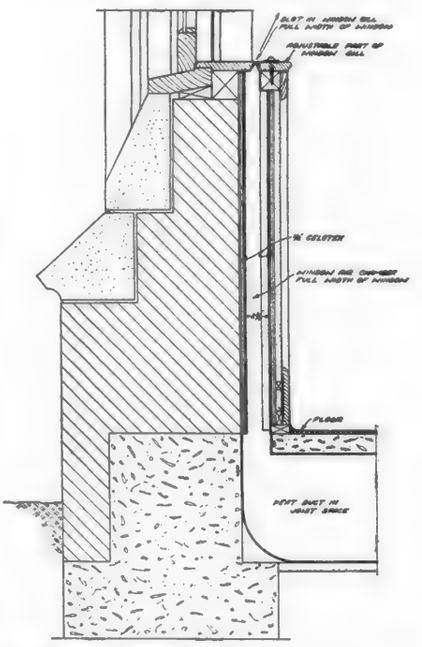


Fig. 1. How Portion of Air is Introduced Through Slot in Window Sill

pered air and the other warm or hot air, are necessary to supply the properly-tempered air to each room through mixing dampers and individual ducts. A basement corridor, with an insulated dividing wall, serves admirably for these two plenum chambers, making short connections, all that are necessary for the risers to the various rooms.

"The fan equipment drawing its supply from down a shaft which extends through the roof and is also connected

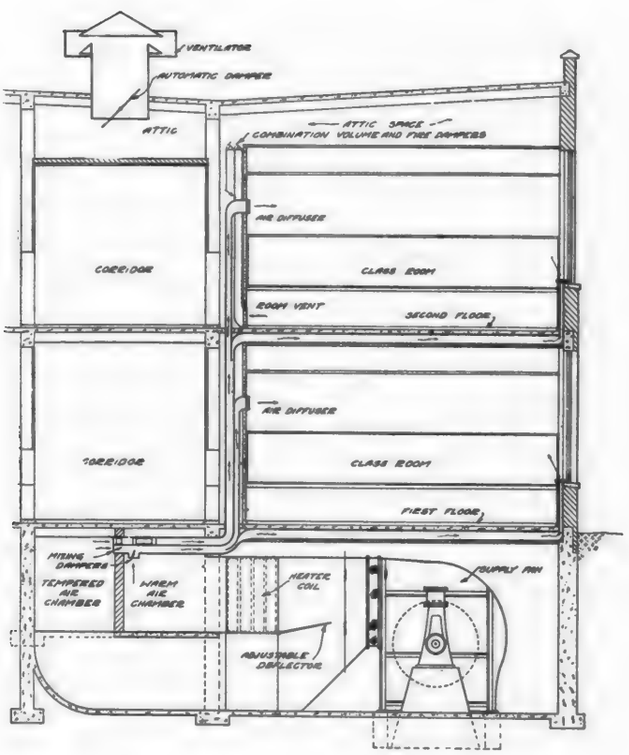


Fig. 2. Typical Section of System Showing How Air is Carried to Window Sill

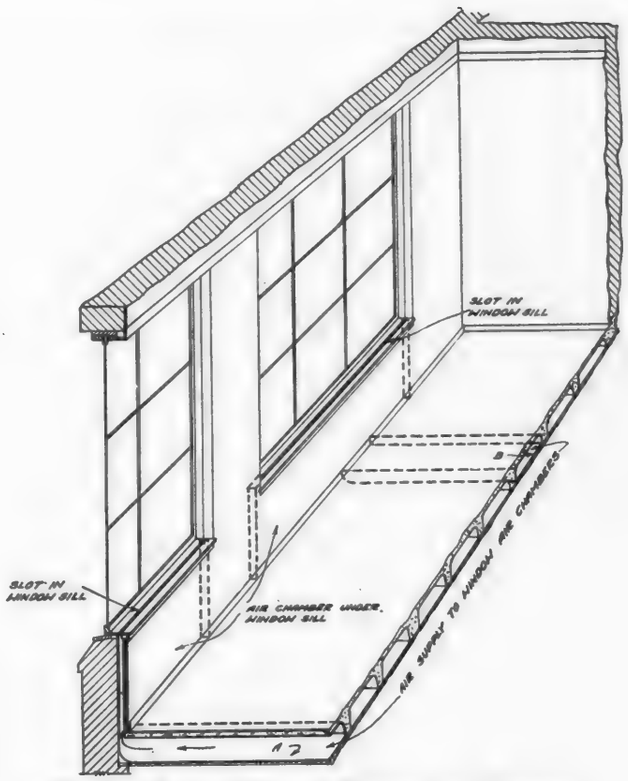


Fig. 3. Section Through Window Air Chamber Built in as Part of the Building Construction

with the attic, makes it possible to recirculate any proportion of the air, all rooms being vented to the attic.

"The air cleansing and humidifying equipment and the automatic temperature control equipment make it possible to deliver to each plenum chamber, cleansed, humidified air of the right temperature. Two supply ducts lead to each classroom, and the room thermostat operating the mixing dampers automatically controls the temperature in the room.

DETAILS OF NEW SYSTEM

"Fig. 2 gives a typical section showing the heating and ventilating system, which is the subject of this paper. In a way, it is a typical double plenum chamber system, with the warm-air chamber and tempered-air chamber side by side, separated by a hollow-tile insulated wall. These two chambers form the basement corridor, making it possible to contact with the risers to the various rooms, without long sheet-metal ducts found in the old blast systems. The pan type of construction for the floors makes it easy to convey a portion of the air for each room over to the window for distribution through the window sill, as heretofore described.

"It is evident, also, from these illustrations, that each room has two separate supply ducts and two separate vents, which makes it possible to divide the regular classroom up into two small rooms or to enlarge any standard classroom without requiring any changes in the heating and ventilating system.

"Fig. 3 shows the shallow window boxes or plenum chambers with their supply ducts and the slots in the window sills through which the warm air is discharged to break up the downward cool currents, already discussed. These window chambers are built in as a part of the building construction and to one who walks into the classroom, the outside wall is a plain, bare wall. The slit in the window sill would give one an impression that the carpenter did a poor job of joinery, but when one puts his hand over this slit and feels the warm air coming out, its purpose is readily realized. This slit is adjustable so as to control the velocity of the air at various points. The volume of the air is controlled by the deflecting damper shown in Fig. 2. The total amount of air for the classroom is controlled by a volume damper, not shown on the drawing.

"The window air box or plenum chamber (see Figs. 1 and 3) is only 2¾ in. in depth and is insulated on the inside, as well as on the outer side. The row of pupils along the outside wall of the classroom do not suffer from the cold drafts of the old blast system nor the radiant heat from radiators in the split system. They are sitting in a room where the temperature is practically uniform and where there is no obstruction to the outside aisle."

This, with the report of committee which redrafted the by-law proposed at the opening session, concluded the meeting. It was announced later, however, at the banquet in the evening, that the nominating committee had nominated Dean F. Paul Anderson, now first vice-president of the society and the host of the occasion, as the next president of the society. This announcement, made by Mr. Mensing, of Philadelphia, was greeted by prolonged applause. Other nominations, announced at the same time, were: For first vice-president, Professor A. C. Willard, of the University of Illinois; second vice-president, Thornton Lewis, of Philadelphia; treasurer, Walter E. Gillham, of Kansas City. Members of Council (for three years), W. T. Jones of Boston, John Howatt of Chicago, C. V. Haynes of Philadelphia, and Willis H. Carrier of Newark; (for two years) Lee Moore of Pittsburgh, J. F. McIntire of Detroit, E. B. Langenberg of St. Louis, and J. J. Kissick of Cleveland; (for one year) Howard Fielding of Denver, Professor F. B. Rowley of Minneapolis, Harry A. Angus of Toronto, Roswell Farnham of Buffalo, and W. H. Driscoll, of New York, the retiring president.

Unit Heater Manufacturers Organize

During the meeting fifteen manufacturers of unit heaters assembled in Lexington and effected a permanent organization, adopting the slogan, "Heat with Unit Heaters." Thornton Lewis, of the York Heating & Ventilating Corporation, Newark, N. J., was elected president. The other officers elected are: Vice-president, H. J. Wheller, of the L. J. Wing Mfg. Co., New York; secretary-treasurer, Judge Cressup, of Buffalo.

How Kentucky Opened Its Arms to the Heating Engineers

Dean Anderson

FROM the time the convention delegates arrived in Lexington, many of them reaching the city the evening previous to the opening of the meeting, things began to happen, some of which were scheduled and some not.

The first important social event was a luncheon and bridge party given at the Ashland Golf Club to the ladies by Mrs. F. Paul Anderson. The well-appointed clubhouse, a short ride from the hotel, presented a most attractive setting for the party, which was attended by over 100 ladies, including many of Lexington's most charming hostesses.

In the midst of the festivities the men of the convention arrived to play golf. Nearly fifty players participated in the tournament.

The only failure of Dean Anderson's committee to function properly came near the close of the afternoon, when the word was passed that the gentlemen of the party were to convene at the "nineteenth hole," a hard drive from the eighteenth, but worth it. This not-in-the-least-imaginary spot was located on the beautiful grounds of Meadowthorpe, the country home of Dr. Sam H. Halley, on the Leestown pike. The error of the entertainment committee consisted in giving the starting signal first to the loafers who had just watched Dean Anderson's miserable efforts with the driver. The result was that the loafers got there first. Buses and private cars stopped with a lurch a few yards from the green, as the aroma of mint** reached the nostrils of the arrivals. Dr. Halley lived up to and beyond the reputation of a Kentucky gentleman, and the rally on the "nineteenth" will linger long in the minds of those fortunate enough to be his guests. The real golfers who arrived half an hour late were not so fortunate as those first in, who were clustered around an enormous old mahogany table that seemed fifteen feet in diameter. Huge silver dishes piled with sandwiches were nobly handled by white-clad old-time negroes, some of whom were born and brought up on this famous estate. Dr. Halley was proclaimed "a jolly good fellow" in washed-out harmony, led by Farrar, and individually by his guests, as they reluctantly re-embarked for more formal entertainment in Lexington.

On the following day, Thursday, the entire convention party participated in a burgoo picnic on the campus of the University of Kentucky and the mysteries of this delicacy were finally revealed. Far be it from the writer to attempt to name its ingredients. Perhaps it will suffice to say that it had the appearance of Mulligatawny soup and the flavor of beef stew. At all events, when the luncheon was ready, the large pots in which the burgoo had been brewing at the foot of the campus were soon emptied by the hungry picknickers.

Host of the American Society of Heating and Ventilating Engineers at its Mid-summer meeting in Lexington.

During one of the interims the golf prizes were presented on the lawn by C. W. Farrar, of the Excelso Specialty Works, in a characteristic manner which aroused howls of merriment.

After dinner at the hotel the party again were the guests of the university at the "Engineers' Frolic" in the gymnasium. The interior had been transformed with flags and bunting. Over 200 dancers were on the floor, all in fancy costume, furnishing a scene of gayety delightful to behold. The convention party was furnished with "stove-pipe" hats for the men and paper caps for the ladies and were then admitted to the dancing floor. Judges for the most original costumes were chosen from members of the society, including President William H. Driscoll, H. W. Wendt, Willis H. Carrier, Thornton Lewis and J. I. Lyle. After a grand march during which the winners were chosen, a cloud of toy balloons and confetti was released from containers suspended from the ceiling and the party from that moment rapidly took on the characteristics of a carnival.

The final outing of the meeting consisted of an automobile ride over a selected route entirely encircling Lexington and covering some sixty miles. During the ride the party visited several extensive horse-breeding farms. The tour then led to the home of Man-o'-War, the famous race horse. Arriving at the stable the party was shown to the spacious stall of Man-o'-War, with his name emblazoned in brass letters on the door. The super-horse, as he has often been called, submitted gracefully to the admiring glances of his visitors for a time but the arrival of new hay to his manger ended the reception as far as he was concerned.

Friday evening was reserved for the society's semi-annual dinner. Special significance was given to the occasion through the fact that all of the past presidents who were present were to be given medals commemorating their terms of office. At the speakers' table were President William H. Driscoll, who acted as toastmaster; Dean Anderson, President Frank L. McVey of the University of Kentucky; former Governor E. P. Morrow of Kentucky, Col. Charles Morrow, and the following past presidents of the society: D. M. Quay, of Cleveland; Professor James D. Hoffman, of Lafayette University, Purdue, Ind.; John F. Hale, of Chicago; Samuel Lewis, of Chicago; H. M. Hart, of Chicago; J. Irvine Lyle, of New York; F. R. Still, of New York; E. Vernon Hill, of Chicago; and J. R. McColl, of Detroit.

After presenting the medals to the past presidents, Chairman Driscoll called upon Dean Anderson to introduce the first speaker, President McVey. Dr. McVey expressed the pleasure of the university in the visit of the engineers and declared they must all be philosophers to choose to contribute as they are doing to the comfort and health of the human race.

Col. Morrow, who spoke next, declared that no man who has traveled about the world as he has, meeting engineers in every place of hardship, can doubt that they are the great soldiers of the world, the builders, accomplishers and real doers.

Former Governor E. P. Morrow, a brother of the previous speaker, whose close resemblance to him was a cause of facetious comment by the chairman, who declared he could not tell which was which, after voicing the feeling of honor of the whole city in the meeting of the engineers, told some typically Kentuckian stories, including one relating to his introduction into politics in one of the mountain counties.

The ballroom of the Phoenix Hotel was elaborately decorated for the dinner, with blazing letters "H V" behind the dais. The floral decorations of iris were given by Dr. Frank T. McFarland, of the Department of Botany at the University, and were taken from his own gardens on the Versailles Pike. Over 200 guests enjoyed the festivities.

Relations of Engineer to Architect and Owner

A *Symposium*

Typical Conditions in a Mid-Western City

ANY engineer who has worked for a few years for the general run of architects could make plenty of comments on this subject, but most of them would be unprintable. Most of the architects who do employ engineers have been forced to do so because of a guilty conscience. Having for years gone to the various specialty men and contractors to have their work laid out for them it becomes hard for them to have to dig down into their pockets and pay for the services of an independent engineer. They do all manner of things to salve their consciences, such as agreeing to pay the so-called engineers for the specialty companies fees for their services in case they do not sell the materials. They may not put this down in writing, but that is the way it is often handled.

"I was called in as consultant on a little ventilating job on which the contract was probably $3,000.00 and found that one of the so-called engineers for the specialty company had been employed and paid his fee for making the plans and specifications. The specifications called for his materials *flat* and, when the owner came to take bids, he refused to separate his price on the various specialties and was attempting to force him to buy from him at a price several hundred dollars above estimates on other materials which are considered equal. The owner saved some $500.00 over and above my fee and I feel quite sure will have just as good a job in the long run as though he had bought the materials specified.

"I know an architect who, in attempting to save a structural engineer's fee, employed a draftsman to handle this work in his own office, thinking he was getting an engineer's service. After the drawings of a large building has been nearly completed he found that his structural engineer could not be relied on and he was compelled to re-design the job. This cost him more money and time and he lost a good deal of the respect of his client. On the mechanical work of the building he turned it over to a friendly material man and, since the contract has been let, the plans have been changed many times, causing extra expense.

"He is beginning to find many of the important rooms are entirely without adequate ventilation.

"Several years ago an owner erecting a large bank and office building was tipped off to the fact that his architect had turned his mechanical work over to a material man to design for him. The owner came to me to re-design the plans, stating that the architect's services had been dispensed with. In the revision of the plans I saved the owner some fifty thousand dollars, but when he came to dispense with his architect he found that he had a contract that could not be broken. The result was that the architect superintended the installation of the plant under my drawings and, of course, did everything in his power to discredit me.

"I think some day I will write my 'memoirs' on this subject and when I do I will have a book larger than Dr. C.-E. A. Winslow's volume on 'Window Ventilation,' and of considerably more interest."

Architects Should Charge Special Fees Covering Engineering Work

By Walter E. Gillham

Consulting Engineer, Kansas City, Mo.

W. E. Gillham

MR. REYNOLDS, in the April issue of THE HEATING AND VENTILATING MAGAZINE on the "Relation of the Engineer to the Architect and Owner" has covered the subject in a very thorough manner and has left very little to be commented on.

The first method used, that is, "where the engineer works in the office of the architect," we assume to mean that the engineer is employed on a salary, the same as other draftsmen in the architect's office, or works on an hourly basis. Under this condition the engineer would be entirely subject to the architect and he would not have the freedom that he should have in the proper design of the plans or various systems in connection with the mechanical equipment of the building. This method usually results in the placing of all of the mechanical equipment on the same drawings with the general architectural plans, which results in a great deal of confusion and lack of detail for the mechanical work.

An engineer who will accept such employment is usually of the mediocre class and one who does not have the ability to handle an organization of his own.

Such methods also usually result in the tracing of the mechanical work being done by architectural draftsmen who do not have any special interest in the design and, therefore, do not give it the thought and study that they give to their architectural drafting.

There are, of course, a few large architectural offices that can afford to maintain a complete engineering organization. These are an exception, and while the engineer in charge is generally on a salary, he is very often a high-grade man and capable of good work. His work, however, is usually along the same lines and he does not have the benefit of the great variety of engineering work such as is handled by the practicing engineer.

The second method, "where the engineer works on a sub-contract through the architect's office," we take to mean the engineer maintains his own office and is employed on a commission basis by the architect. This probably is the most generally-used method where engineers are employed and is a very satisfactory arrangement, especially if the architect takes the engineer into his full confidence and has him present at all conferences with the owner where questions pertaining to the mechanical work on the building are discussed. It is not, however, so satisfactory if the architect endeavors to conceal from the owner the fact that he is employing an engineer and tries to convey to the engineer the second-hand information regarding the wishes of the owner. The architect's

knowledge of mechanical work is often limited and he fails to properly interpret the owner's wishes, and the result is that the engineer must use his own judgment or do a great deal of guesswork and stands the blame for mistakes which are not his.

Architects, especially younger ones just starting in business, often have the feeling that it is a reflection on their ability to employ engineers to handle their mechanical or structural work. The reverse, however, is really the case, and an owner would place more confidence in his architect if he plainly stated that he was employing the best available engineering talent to handle that part of the work.

The third method, or "where the engineer works on an independent contract direct with the owner," no doubt, proves most satisfactory to the engineer, but the architect does not like this arrangement because he is generally cut out of an engineering fee for the mechanical work. Furthermore, it is necessary for him to take some orders from the engineer as the engineer can insist on the proper amount of space for his equipment.

It is essential on every job that the architect and engineer work in accord so as to get for the owner the best possible layout and one which will make for the lowest first cost and the least cost in operation.

When an architect employs an engineer under the second method he generally arranges to keep the entire fee for supervision for himself, allowing the engineer just the cost of preparing his plans and specifications and often insists on the engineer cutting his fee below general practice in order to get a profit for himself on the work done by the engineer.

No doubt the best method to pursue would be for the architect to insist on the owner paying him a special fee to cover engineering work. The architect is entitled to extra compensation for all special engineering service. This would give the owner a much better job and both the engineer and architect would be paid their regular fees and there would be no need to slight any of the work.

Fixed Standards Needed Covering Character of Plans and Specifications Prepared by Engineers

By Carleton F. Tweed
Chief Engineer, Arlington Engineering Co., Chicago.

AN important matter in the engineer's professional viewpoint is that there is a great need for an educational publicity campaign through which the professional engineers, as a group, could educate the public, which means the owners, to the idea that it would be better practice to employ engineers on a direct contract.

Another important proposition is that professional consulting engineers need a complete house-cleaning. The principal item in this is that there should be established a fixed standard as to the character of the plans and specifications to be prepared by engineers.

This standard would also fix the amount of work which the engineer would contract to do in connection with any work. By this we mean that the engineers, as a group, should agree to eliminate all engineers specializing in schematic plans and also to eliminate the possibility of engineers' agreeing to prepare mechanical equipment plans and specifications only and permit the architect to supervise the work. The substance of this is that we believe the fixed standard for engineers should be very complete plans and specifications drawn to show all of the equipment in detail; this to be followed by complete mechanical supervision of the job under construction by the mechanical engineer.

In the article in THE HEATING AND VENTILATING MAGAZINE, you mentioned that the architect is entitled to some percentage of the cost of the mechanical equipment for correlating architectural and engineering plans. We disagree with you on this question for we believe it is a fifty-fifty relationship or, at any rate, we do not believe that the usual practice of some architects of trying to advise the owners that they are entitled to extra percentage on the mechanical equipment for their work of correlating the plans is sound.

In other words, the architect should receive from the owner a straight percentage fee on the architectural construction, which could be 6%, 7% or 8%, as he chooses, but it should not be stated to the owner as 6% on the general work plus 1% or 2% on the mechanical equipment, in an effort to show the owner that the architect had something to do with the mechanical equipment. This is purely architectural bunk and has been swallowed by the engineers for the last fifteen years.

We are at this time working out a hotel building on a basis which, we contend, is the proper way of handling mechanical equipment. On this job, we ourselves, paid the architect his full fee of 6% on the general construction and are charging the owner 6% on the mechanical equipment.

We should appreciate your opinion of the idea of forming a separate society composed entirely of consulting mechanical equipment engineers who, in order to become members of this society, would agree to do work for not less than a straight 6% fee on the mechanical equipment work and would at the same time agree to prepare their plans and specifications in accordance with the recommended standards of this society and which fee is to include supervision of the mechanical work.

Owners Should Insist on and Pay for Collaboration of Engineers

By Thomas Barwick
Of Buchman & Kahn, Architects, New York.

Thomas Barwick

REFERRING to "Relations of Engineer to Architects and Owner" in your April issue, there are certain portions that can be discussed with propriety.

Your correspondent asks which of the methods named have proven the most satisfactory:

From my long experience as a consulting engineer with my own office, as contractor's engineer, and as consulting engineer in an architects' office, I can probably answer the question from each angle.

As a contractor's engineer the question would relate to a selfish disposition, although my employer was one of the most liberal and conscientious men that I have had dealings with; still, the competitive method required considerable tact to bring a profitable return and do work that would satisfy an ambitious man and a client whose recommendation would bring further consideration and reference.

The average contractor will seek substitution, and often substitutes offered are not such as are of the best and most economical in operation for his client.

Therefore, the question as to what will give the owner the best results is sometimes misplaced by the offering of material or appliances that save at first, but eat up the savings in a short period.

An owner is not an engineer; therefore is susceptible to a deduction for a substitute, whereas a qualified consultant would regard a substitution as a detriment unless known by him to serve the purpose as economically.

I would not advise substitution from the owner's standpoint. From the disinterested engineer's standpoint it may be advisable. Therefore a proper competition may be established in the use of materials.

Some consultants refuse to consider substitution without regard to the benefit that may be obtained which, if of known quality and utility, should be considered, and a fair reduction made for the owner's benefit.

Often a substitution entails additional work to fit it into the design; therefore, though the substitute may be of equal value to the article in question there will be additions that may cause at some point additional expense.

A contractor's engineer sometimes knows this; therefore by the allowance, can make claim for additions or to so modify the work that a saving to his employer will be gained. This may be considered fair but more often is unfair to the owner.

For this reason I do not think an owner is properly safeguarded by dealing direct, and that a reliable consultant is worth his hire.

From the standpoint of an owner dealing direct with the engineer there are many cases where such is justifiable. Where complex construction requires such service, an engineer is the owner's safeguard. Where beauty is the greatest attainment the architect is the owner's safeguard.

Construction as at present required demands engineering skill, and to make a proper grouping and attractive result requires the architect. Therefore, where these attainments are to be combined there must be a collaboration of both.

This then brings a demand for service by engineers to form a harmonious whole and, since engineering embraces many fields and becomes a specialization, it is necessary to employ them.

Engineering as now required has many branches such as building, utility, heating and ventilating specialization, and each must work in consonance to produce the best result; therefore an office is not a one-man proposition, and the best work, the most economical results, and symmetry and grace are attained where all are collaborating for the benefit of the owner.

In forming a cohesive situation there must be a thorough understanding of all; there can be no ambiguity. Each of the parties of interest must have no selfish motives, not even the owner. Each must strive for the proper attainment to produce the result economically, substantially and beautifully.

As to fees: The owner's best interest is served by proper fee allowance. There can be no scrimping for proper accomplishment. Services entail a large amount of labor, especially the requirements of the engineers where calculations are to establish proper stability, also a proper utilitarian design, and a proper and healthy atmosphere. Therefore large offices with a corps of engineers will attain the best results for the owner.

Where an owner expects to obtain results by limiting the fee, it often proves a most expensive attainment. My experience with my own clientele and in collaboration with architects proves that where all are engaged on the work a simpler and more cohesive result is attained. This is exemplified by many of the structures lately built.

It is true that to attain results the force must be maintained so that a proper understanding of requirements can be established and that small offices cannot maintain such a force of specialists. In such a case an architect can obtain best results from individual specialists who are anxious to attain proper results in collaboration with them but not to dominate. Where such conditions exist the results obtained can be had, but it should be understood that proper compensation must be allowed, as engineering takes more time and study than architecture.

Some architects collaborate with others of known ability for engineering skill in their office; therefore, such services often prove more economical to the architect and to his client, and I advise those who do not have a retinue of consultants to go to one of his contemporaries and thereby get proper advice; two heads are always better than one.

As to the selfish motives of engineers, to which Mr. Reynolds remarks, they are not engineers. No true engineer is interested in anything but the facts. I appreciate that there are some of such a class who have the effrontery to call themselves *engineers*.

From the facts as above given and from my long experience I advise your correspondent that the best results are obtained for his client where engineers are employed, or in direct collaboration (whether having their own office or not) with the architect from the inception to the finish of the design and completion, and the owner's best safeguard is to insist on such collaboration and pay for it.

Advantages of Having Engineer Employed Directly by Owner

By John Eadie

Eadie, Freund and Campbell, Consulting Engineers, New York.

THE article by T. W. Reynolds in the April issue of THE HEATING AND VENTILATING MAGAZINE entitled "Relations of Engineer to Architect and Owner" appears to me to be a very fair presentation of the problems involved and I agree in general with his conclusions.

Probably most engineers find the average architect has very imperfect conceptions of many engineering problems upon which he asks advice and also because of the difference in their training, it is often more difficult for the architect than for the engineer to understand the owner's problems where the building is to be used for commercial or industrial purposes.

As Mr. Reynolds points out, the personal equation must of necessity affect any given case, but where the owner expects to use the building for commercial or industrial purposes, or in any case, where he is interested in the use to which the building is to be put, it will be best for him to employ the engineer directly.

Such an arrangement, while still permitting the engineer and architect to work in perfect harmony, insures the engineer's presence at all important conferences. Understanding both the owner's and architect's problems, he is in a better position to give intelligent advice in working the engineering features into the general scheme; also, such direct contact with the owner enables the engineer to present his arguments for modification of proposed architectural details, to accommodate engineering features, in an atmosphere where the problems of occupancy will be given equal weight with problems of design.

In the case where the owner builds purely for investment and has no direct interest in the occupancy of the building, the independent judgment and opinions of a competent engineer will still prove of value to him. While many engineers preserve their independence and express their opinions frankly, whether employed by architect, or owner, the personal equation cannot be ignored and the owner's interests will, in general, be better served where the engineer is directly related to those interests.

The Pittsburgh Tax Plan

A recently-circulated letter and folder from the Allied Boards of Trade of Allegheny County urges the adoption of "The Pittsburgh Plan" by other cities. This plan, briefly stated, contains two notable features: first, the entire tax revenue for municipal purposes is derived from taxes on real estate, there are no taxes levied by the city government on any other form of property or income; second, the municipal tax rate on buildings is fixed at one-half the tax rate levied on land, this feature being known as the graded tax.

The main purpose of the plan is to remove the burden of taxation from the personally-created values of industry and enterprise and place it, where in all equity it belongs, on the community-created values of land. The graded-tax feature serves to place a premium on vacant land held for speculation and on large private estates and thus converts such property to industrial use. This spells employment for both capital and labor.

The plan has been in operation in Pittsburgh since 1914 and the folder carries statements of many of the industrial firms located there to show that it has been accepted as a great success. Some results obtained in that time are stated as follows: The number of building permits issued, per 1000 of increased population from 1914 to 1925, has greatly exceeded figures compiled on the same basis for competitive cities; taxes on houses have been reduced, on the average, 21%; people have become encouraged to become home-owners; land improvement has been hastened; and the tendency toward land speculation has been reduced.

Research Sounds the Knell of the Steam-Type Radiator

Air Elimination, the Crux of the Problem, Found to Be as Complete with Water Type as with Steam-Type Radiators, When Air Valve is Properly Located

(*Continued from May Issue*)

The Kewanee Boiler Company's Tests

In the tests conducted in the laboratories of the Kewanee Boiler Company, which were under the supervision of C. E. Bronson, chief engineer, the particular object was to compare the course of air elimination from a water pattern and a steam pattern radiator when operating on a one-pipe heating system.

Due to the increasing use of vapor and vacuum systems of steam heating, it is stated, in the report of these tests, the water-type radiator has been gradually displacing the older steam-type radiator. It has been the opinion of a great number of people in the heating industry that for the single-pipe steam heating system it has been necessary to use only the steam-type radiator. One of the arguments has been that the air could not be vented properly from the water-type radiator when used in this type of heating system. It was also thought necessary to have the air valve located about two-thirds the height of the radiator above the floor level in order to keep it from discharging water with the air, as well as to keep the air valve from being heated by the incoming steam for as long a period as possible.

Development in air valve design renders it possible to obtain an air valve which not only will close against steam but will close when water is present. This removes the principal objection against lower locations of the air valve.

Since steam reaches the air valve sooner with the water-type radiator through the nipple connections at the top of the radiator, it was considered that the steam would reach the air valve quite soon after entering the radiator, thereby closing it and preventing complete air elimination. The tests indicate that this is not true.

These tests were conducted on both steam and water-type radiators to determine the time necessary for complete air elimination, as well as the influence on air venting due to the location of the air valve.

Two standard Kewanee radiators were used, one a water pattern and the other a steam pattern, each consisting of 19 sections of 3-col. 38-in. high. The radiators were tested separately from the same steam outlet. Steam was supplied to the radiator from a heating main through a 1-in. pipe connection in which the steam and condensation flowed in opposite directions. A drip was provided at the bottom of the riser to remove the condensation of the main. The radiator tapping was 1½-in. pipe size.

The air was exhausted from the radiator to a No. 1 Hoffman Sylphon air valve connected to the end section opposite the steam supply. The height of the air valve was varied on different tests in order to determine its effectiveness in these locations.

For one test of the water radiator, the upper connection between the two end sections opposite the steam inlet was plugged shut, in order to prevent the steam entering the last section from the top.

Thermometers were placed in the end and center sections of the radiator, as indicated in Fig. 7, for determining the flow of steam and air within the radiator. These were inserted into thin steel thermometer wells through the edge of the sections.

METHOD OF OPERATION

Before each run the steam was shut off and the radiator allowed to fill with air. When the radiator had cooled to nearly room temperature, which ranged from about 45° to 60° F., the steam was turned on. Temperature readings were then taken so as to determine the flow of steam through the various zones of the radiator during the period in which the air was being exhausted. The steam pressure varied from 1 to 3 lbs. gage.

RESULTS

The results of these tests were shown on the curve sheets on which were plotted the temperature readings at the various points inside the radiators against the time. Inspection of the curves shows that the air, in being expelled from the radiator, is driven to the bottom and to the end of the radiator opposite the steam inlet.

The rate of heating was more rapid for the water-type radiator than for the

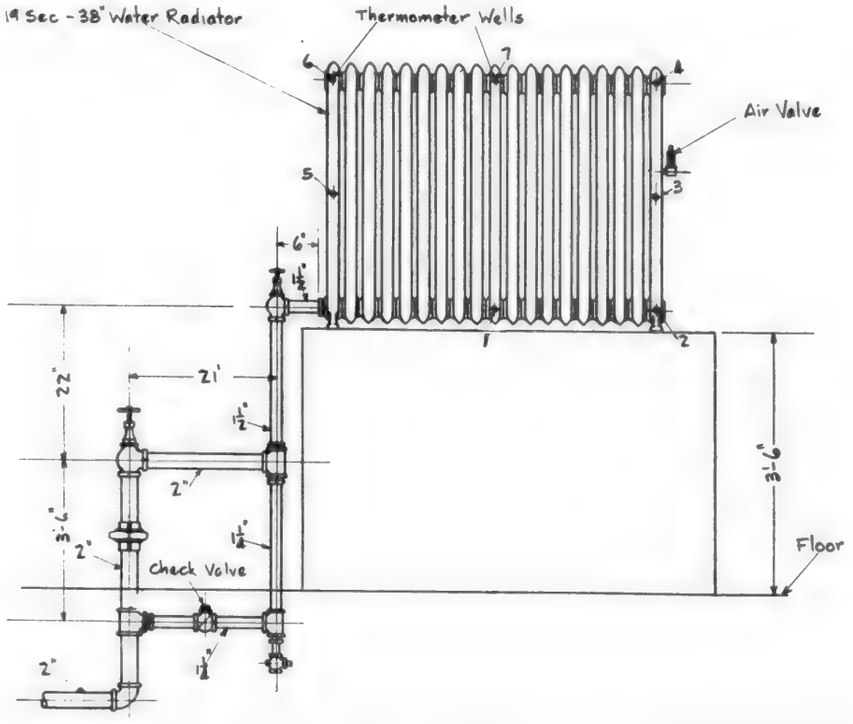


Fig. 6. Setup for Kewanee Radiator Tests

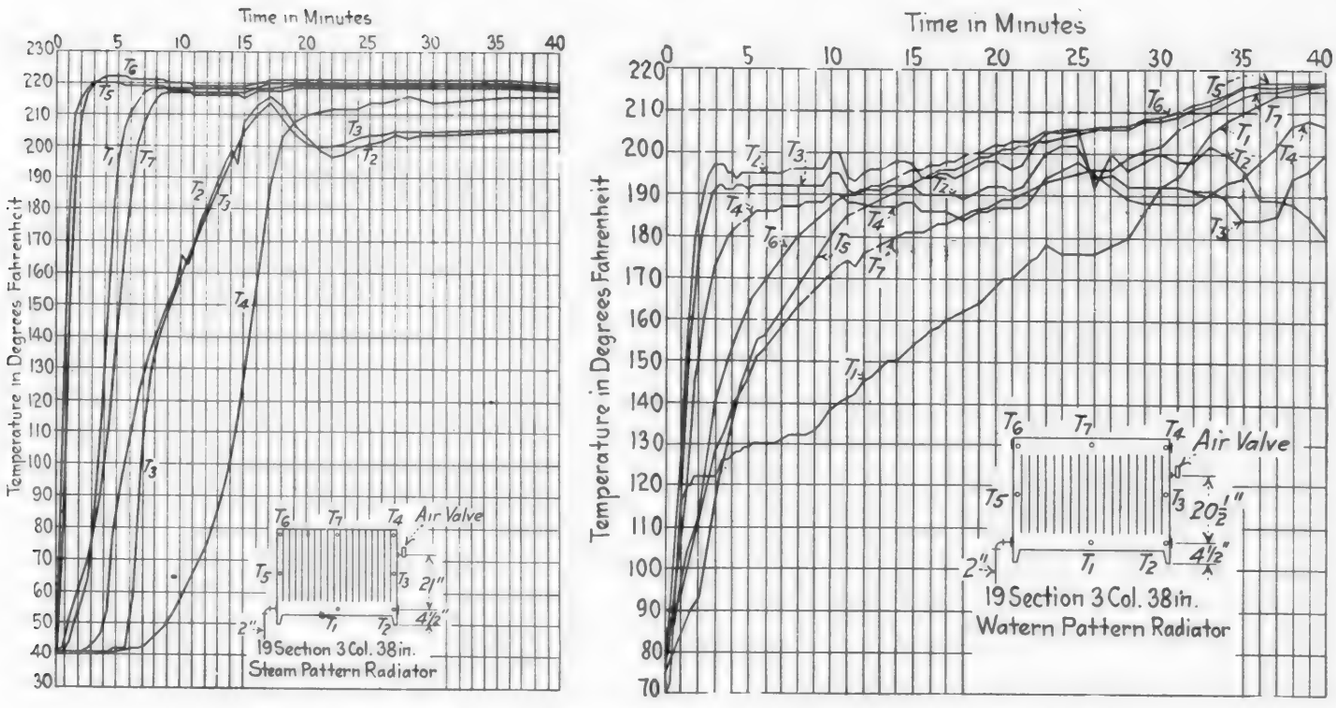


Fig. 8. Air Elimination Tests of Steam-Type and Water-Type Radiators with Air Valves 25½ in. and 25 in. Respectively, Above Floor Line.

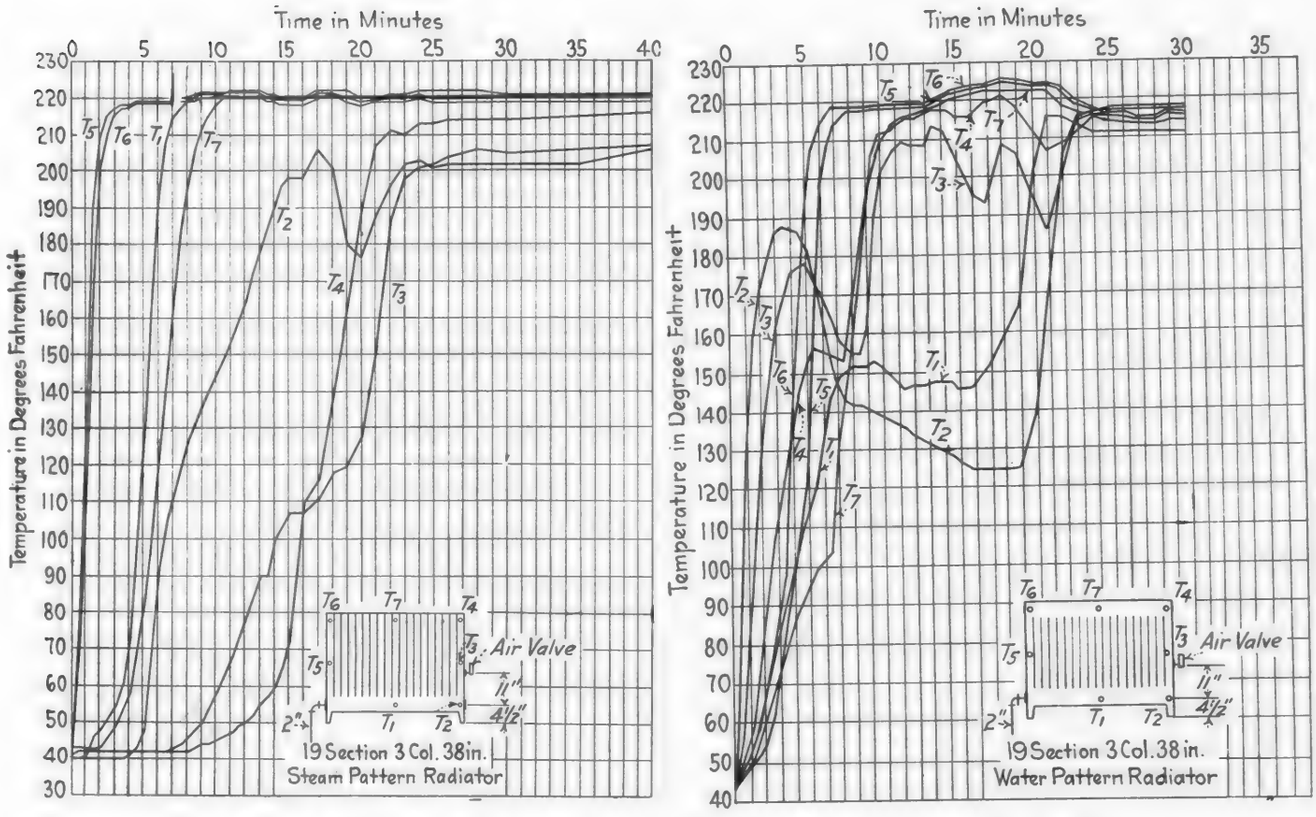


Fig. 9. Air Elimination Tests of Steam-Type and Water-Type Radiators with Air Valves 15½ in. Above Floor Line.

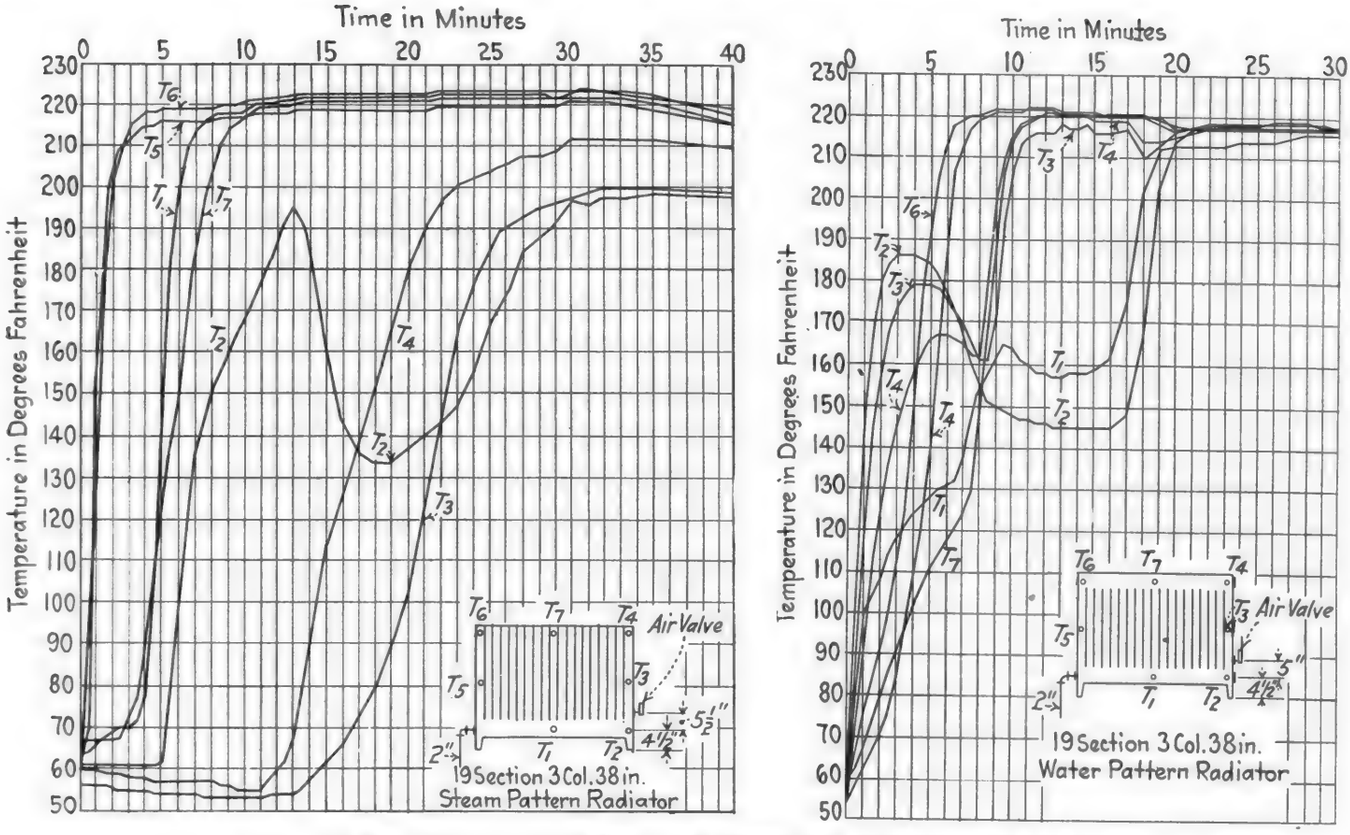


Fig. 11. Air Elimination Tests of Steam and Water-Type Radiators with Air Valves 10 in. and 9½ in. Respectively, Above Floor Line.

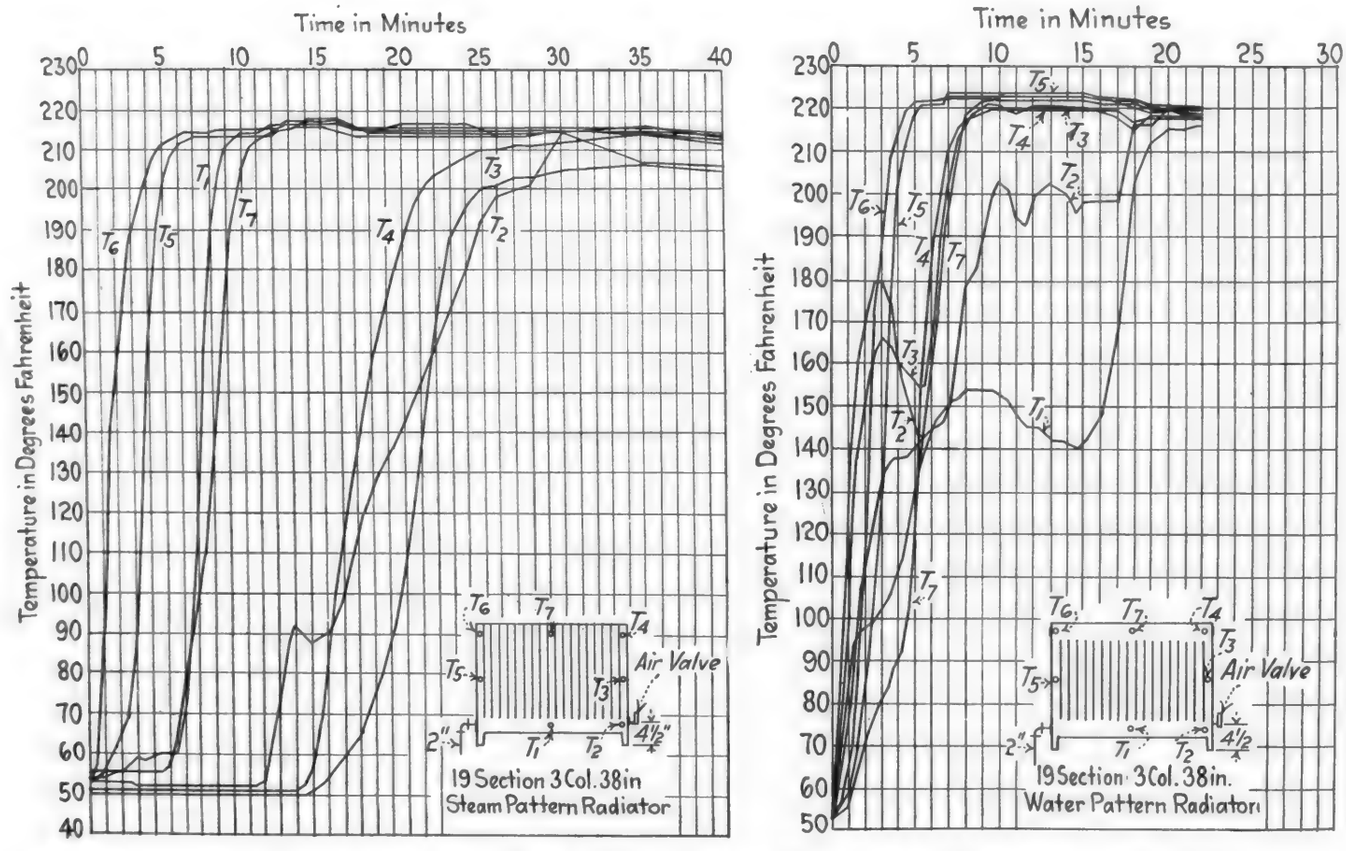


Fig. 12. Air Elimination Tests of Steam Type and Water Type Radiators with Air Valves 4½ in. Above Floor Line.

steam type. This is undoubtedly due to the upper header connection between sections in the water-type radiator. As indicated by the temperature readings, the sections nearest the steam inlet allow the entering steam to rise almost immediately to the upper header, through which the steam is then distributed to all remaining sections.

The drop in temperature in the last section indicates the primary closing of the air valve. After this primary closure the action of the air valve was intermittent in allowing egress of air from the radiator.

With the air valve 25 in. above the floor in the water-type radiator, which is the standard air valve height for the steam-type radiator, air was trapped in the lower part of the last section and this point did not reach steam temperature. This was assumed as indicating incomplete air elimination.

Similar indications were observed with the steam-type radiator tests. A somewhat shorter time was required to reach constant temperature conditions with higher locations of the air valve in the steam-type radiator, but complete elimination of air in the last section of the radiator was not obtained.

In order to compare readily the time required to reach constant temperature conditions, Table I has been prepared, giving a summary of all tests.

It was thought that the water-type radiator would vent faster if the top header connection between the last two sections were plugged, so as to prevent steam from entering the last section from the top. Only slight benefit was derived. Temperatures became constant in 20 min., as compared with 22 min. for the same location of air valve.

CONCLUSIONS

(1) Complete air elimination can be obtained with water-type radiators if the air valve is placed approximately one-half the height of radiator from the floor, or in lower positions. Lower positions of the air valve are more effective.

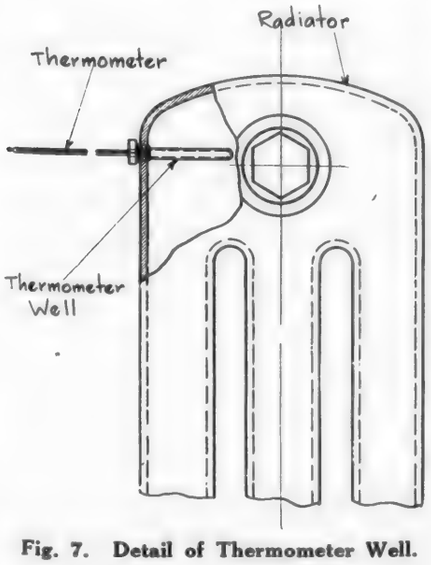


Fig. 7. Detail of Thermometer Well.

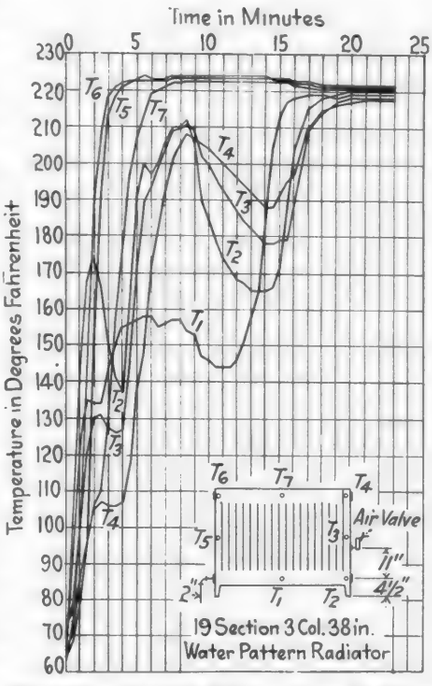


Fig. 10. Test of Water Type Radiator with Upper Connection Between Two and Three Sections Opposite Steam Inlet Plugged.

(2) Incomplete air elimination occurs in steam-type radiation. Higher positions of the air valve seem to be more effective.

TABLE I

Radiator Type	Height of Air Valve above Flr., In.	Time Req. for Constant Temp. Con., Min.	Air Elimination
Water	25	40	Incomplete
Water	15½	25	Complete
Water	9½	22	Complete
Water	5	21	Complete
Water	15½*	20	Complete
Steam	25½	27	Incomplete
Steam	15½	28	Incomplete
Steam	10	32	Incomplete
Steam	5	35	Incomplete

*Top connection between two end sections plugged.

SPECIFICATIONS, USEFUL INFORMATION, AND TABLES COVERING FUEL-OIL are printed in Catalogue 111, Section 15, recently issued by the Petroleum Heat and Power Co., 1775 Broadway, New York. The catalogue tells of the development of the company's fuel-oil delivery service in New York, Boston, Stamford, and Providence, where its bulk stations are located, and then discusses the four general classes of fuel-oil on the market, under the headings of crude petroleum, distillate fuel-oils, residual fuel-oils, and blended fuels. A short description is given of each class of oil. That furnished by the company is known as blended fuel-oil, which is described as a mixture of any or all of the three other classes. Blending with distilled material is often necessary to overcome the high viscosity of the residuums left after the removal of the lighter and lubricating fractions. Blended fuels of this type can often be detected by the ash and salt which they contain. The viscosity is relatively high, and considerably more heat is required to raise them to their burning point when used in oil-burning systems than with the other types of oils.

Under "Tests of Fuel Oil" the items of specific gravity, heat value, flash point, cold test, viscosity, sulphur content, and moisture and sediment are explained in the order stated. The properties and specifications of the Petroleum Heat & Power Company's fuel oil are given as:

Specific gravity at 60° F.	0.9658
Baumé gravity at 60° F.	15.0
Flash point, Pensky-Martens closed cup	183° F.
Minimum Heating Value in B.T.U. per pound (usually runs over 18,400 B.T.U.)	18,200
Viscosity Saybolt Furol. 200 sec. at 122°F.	
Moisture and sediment, determined at 100° F.	0.6%
Sulphur content	3.69%
Specific heat	0.24

Glass—The Problem of the Future For the Heating Engineer

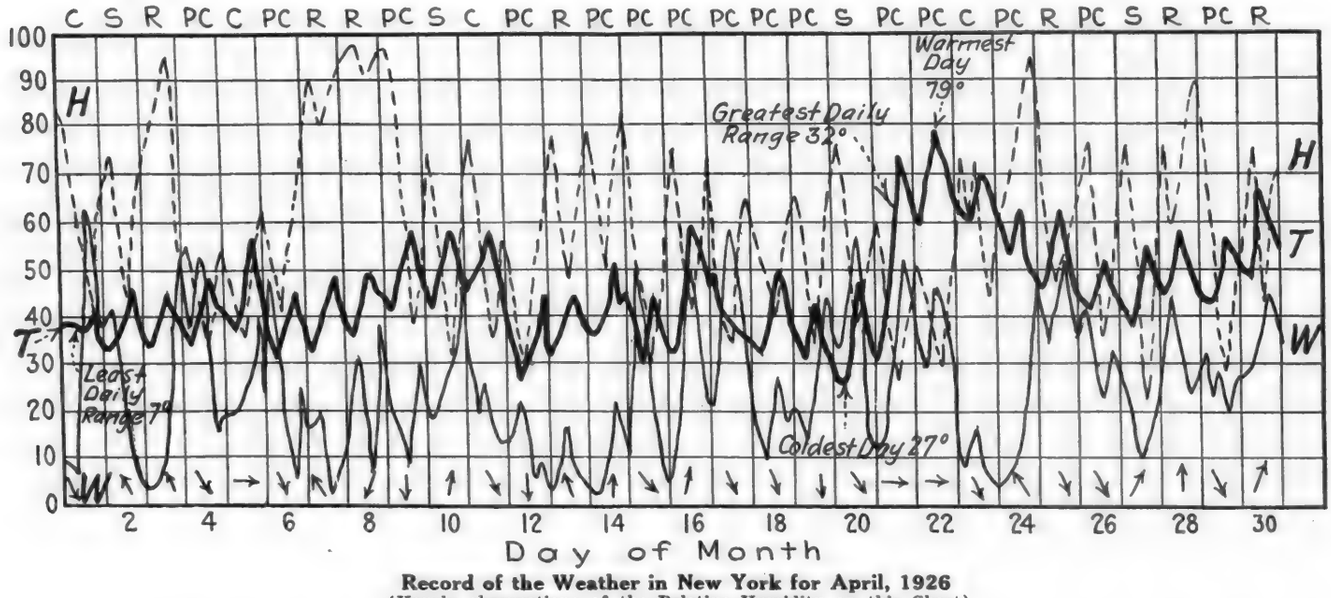
BASED on an interview with William Orr Ludlow, of Ludlow & Peabody, architects for many important modern structures, *The New York Times* predicts, in its Magazine Section of March 21, the advent of the giant skyscraper composed entirely of steel and glass, eliminating the masonry construction which is now used not to give auxiliary support, but merely to present the eye with the appearance of massive security. This development will come, the article states, when architects have learned "to think in steel," which means accepting without subterfuge or concealment the look of steel—a thing we all do in our bridges, but where habitable structures are concerned we cling to our masonry minds and masonry eye.

Mr. Orr is quoted as saying: "There is the aesthetic opportunity offered by building with glass. Here a new world opens up to us. There is no doubt in my mind that when we have properly solved the designer's problem of fusing glass walls with steel construction we shall be able to build structures of the utmost beauty.

"One great advantage of glass," he points out, "even the glass we have now, is that it is completely impervious to air—which cannot be said of any of the opaque building materials from which we make walls. We may be able to manufacture glass that is also impervious to the heat of summer and the cold of winter, but in any event, I see no reason why we should not employ the thermos principle in our buildings—vacuum spaces between double layers of glass walls. This would bring incalculable results in comfort and economy."

The Weather for April, 1926

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F	79	78	80	87	83
Date of highest temperature	22	22	30	30	30
Lowest temperature, deg. F	27	21	23	22	28
Date of lowest temperature	20	12	15	4	1
Greatest daily range, deg. F	32	32	34	42	32
Date of greatest daily range	21	21	7	30	16
Least daily range, deg. F	7	4	7	2	5
Date of least daily range	1	7	1	7	11
Mean temp. for month, deg. F	46.0	44.8	44.9	42.0	50.3
Normal mean temp. for month, Deg. F	49.4	46.2	51.2	46.9	56.1
Total precipitation, this month, in	1.76	1.73	1.46	1.96	4.42
Total snowfall, this month, in	Trace	Trace	0.9	6.6	Trace
Normal precipitation, this month, in	3.3	3.55	2.9	2.88	3.52
Total wind movement, this month, miles	15596	8187	10128	10382	8719
Average hourly wind velocity, miles	21.7	11.4	14.1	14.4	12.1
Prevailing direction of wind	N.W.	W.	W.	S.W.	N.
Number of clear days	4	9	4	10	12
Number of partly cloudy days	18	14	9	7	10
Number of cloudy days	8	7	17	13	8
Number of days with precipitation	8	8	14	9	10
Number of days with snow	0	0	2	4	0
Snow on ground at end of month, in	None	None	None	None	None


C S R PC C PC R R PC S C PC R PC PC PC PC PC PC S PC PC C PC R PC S R PC R
Warmest Day 79°
Greatest Daily Range 32°
Least Daily Range 7°
Coldest Day 27°
H
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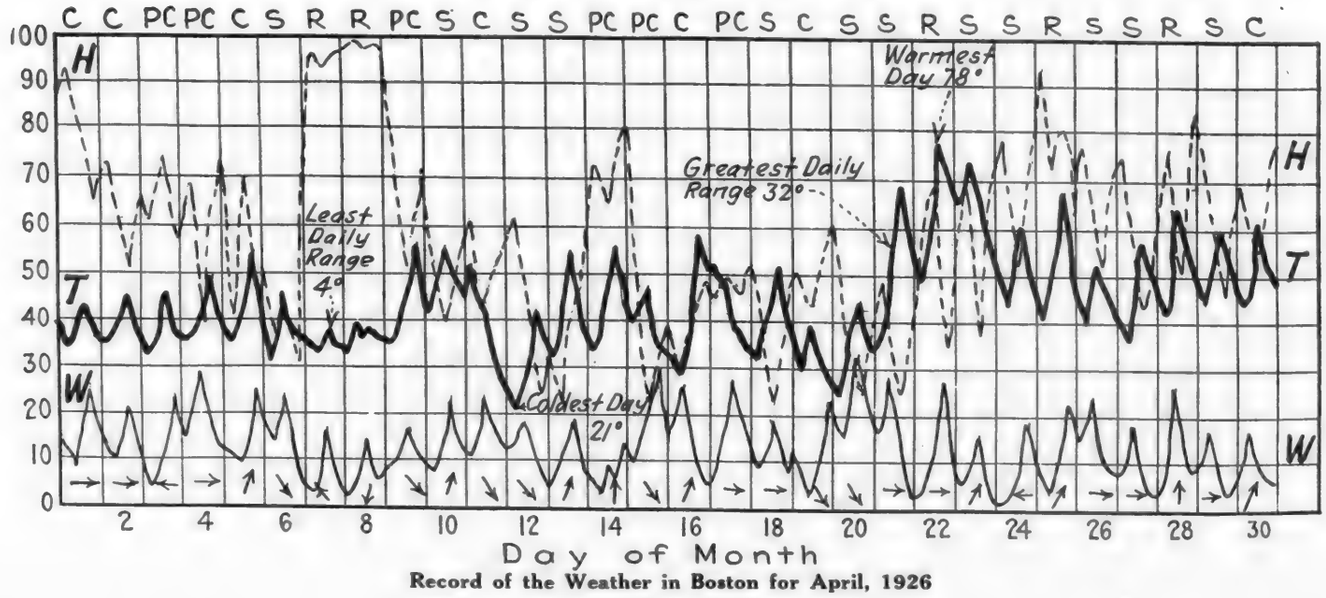
Day of Month

Record of the Weather in New York for April, 1926
(Hourly observations of the Relative Humidity on this Chart)


C C PC PC C S R R PC S C S S PC PC C PC S C S S R S S R S S R S C
Warmest Day 78°
Greatest Daily Range 32°
Least Daily Range 4°
Coldest Day 21°
H
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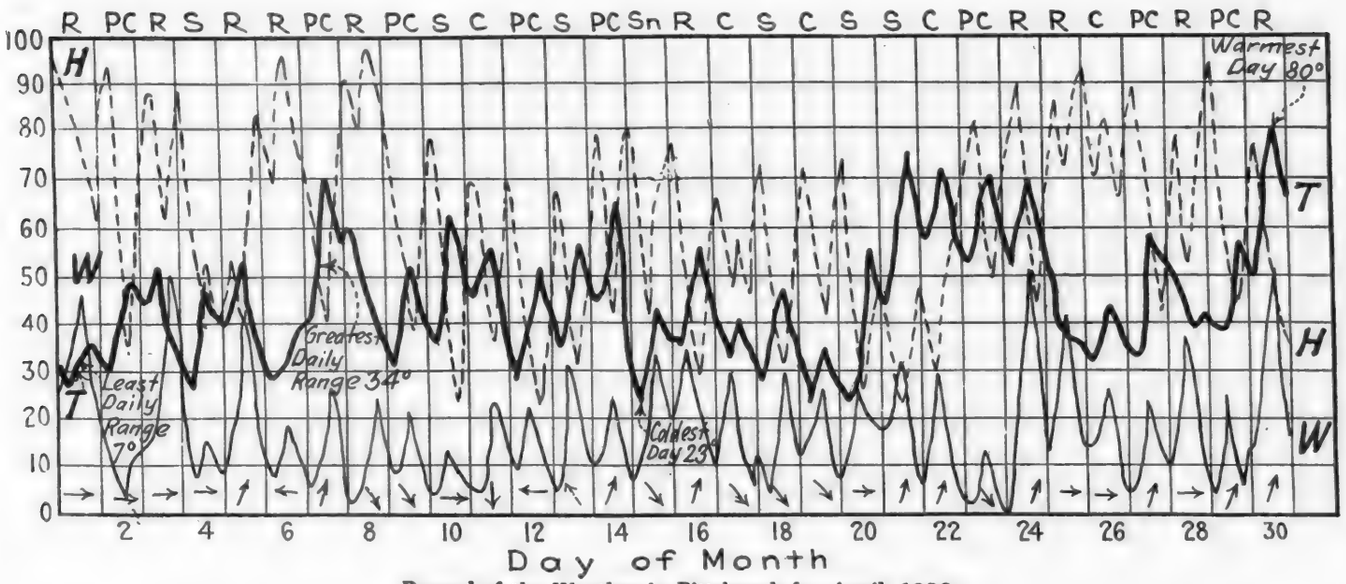
W
Day of Month

Record of the Weather in Boston for April, 1926


R PC R S R R PC R PC S C PC S PC Sn R C S C S S C PC R R C PC R PC R
Warmest Day 80°
Greatest Daily Range 34°
Least Daily Range 7°
Coldest Day 23°
H
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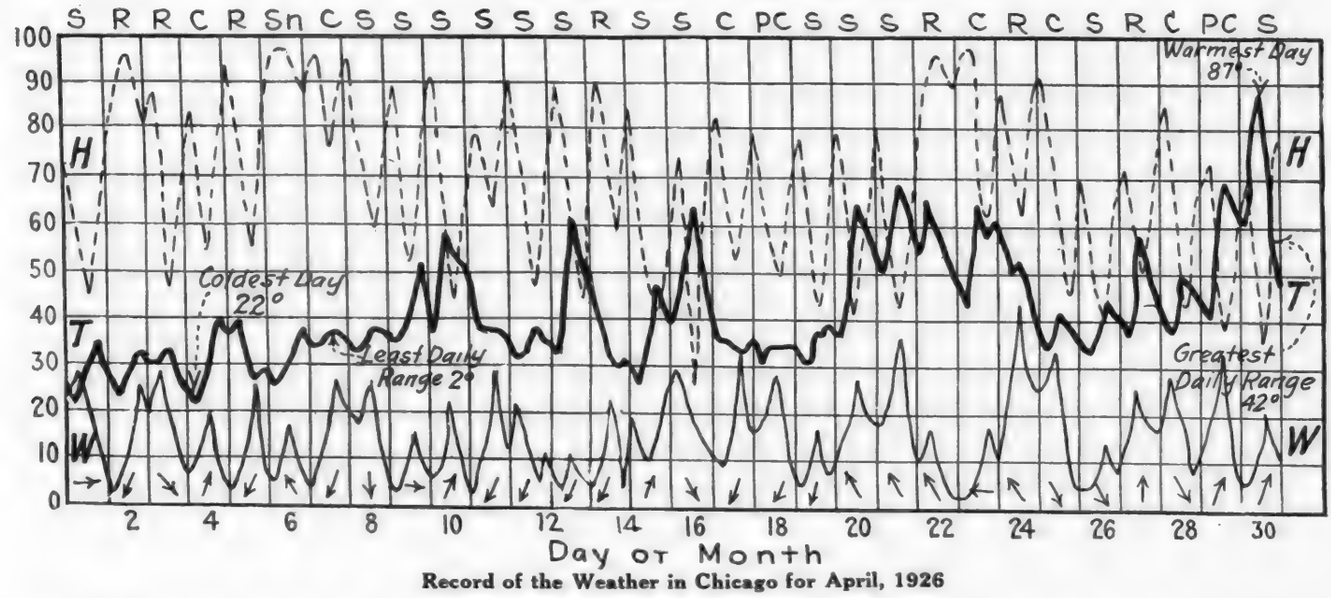
Day of Month

Record of the Weather in Pittsburgh for April, 1926


S R R C R Sn C S S S S S S S R S S C PC S S S R C R C S R C PC S
Warmest Day 87°
Coldest Day 22°
Least Daily Range 2°
Greatest Daily Range 42°
H
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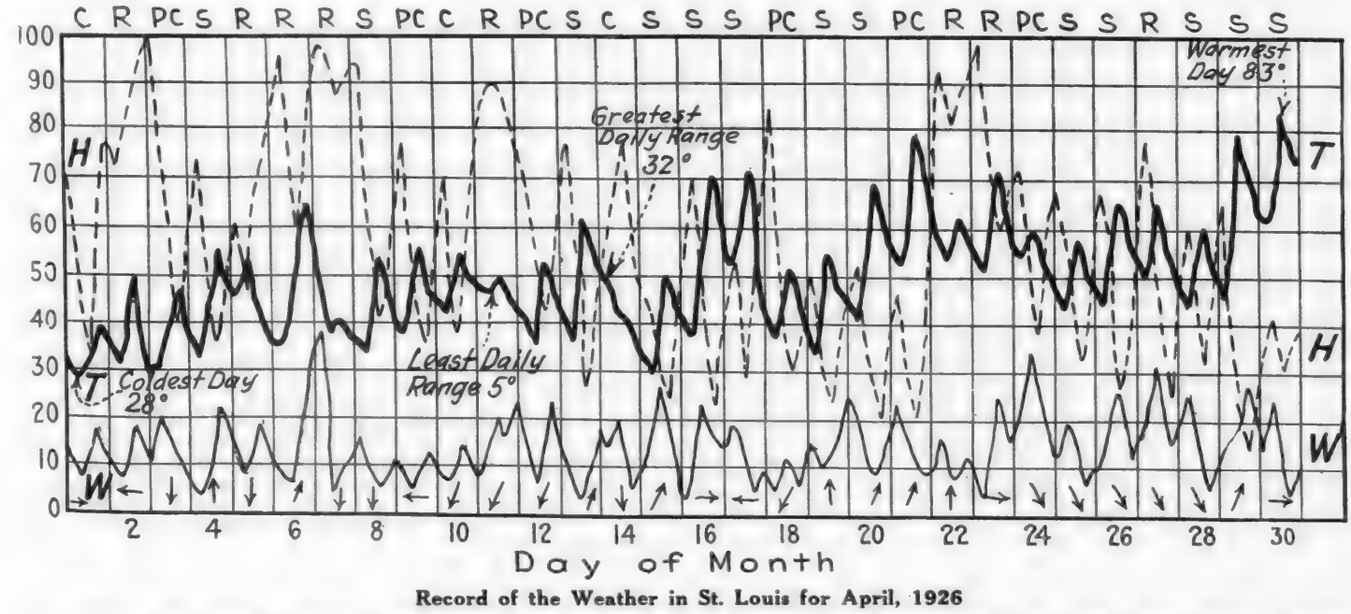
Day of Month

Record of the Weather in Chicago for April, 1926


C R PC S R R R S PC C R PC S C S S S PC S S PC R R PC S S R S S S
Warmest Day 83°
Greatest Daily Range 32°
Least Daily Range 5°
Coldest Day 28°
H
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Day of Month

Record of the Weather in St. Louis for April, 1926

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degrees F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A. M., 12 M., and 8 P. M.
S—Clear, PC—Partly Cloudy, C—Cloudy, R—Rain, Sn.—Snow. Arrows fly with prevailing directions of wind.

The Oil-Burner Ordinance Situation

The Attitude of the Oil-Burner Salesman—A Proposed Standard Form of Ordinance

IT is unquestionably a matter of importance that in all communities where houses are close together, the installation of oil burners should be governed by uniform and comprehensive rules, to the end that the fire risk be minimized. It is unfortunate that some individuals and organizations, identified with the coal trust, have undertaken to meet the spreading use of oil burners with misleading propaganda. One such incident so directly pertains to the subject in hand that it is worth quoting as an illustration.

A booklet was recently received which had the obvious intent of "throwing a scare" into those who might be interested in purchasing oil burners. Fourteen or fifteen pages were devoted to extracts from newspapers, recounting oil-burner fires or fires alleged to be directly due to oil burners. One news item referred to the fact that conditions (in this respect) in Washington, D. C., had become so bad that an ordinance incorporating drastic rules for the installation of oil burners had been drawn up and "will be presented to the Commissioner tomorrow and it is expected that it will be immediately passed."

COAL INTERESTS SPREAD MIS-INFORMATION

Undoubtedly, the impression conveyed to the average reader would be, as is intended, that the increasing number of oil-burner fires in Washington had forced the Commissioner to draw up such regulations as would practically prohibit further installation of oil-burners and thus the excessive risk from this source. To one in touch with the oil-burner situation, however, the entire booklet had a "fishy" look and a check on the Washington situation was made.

It appears that the only truth in the statement was the fact that an ordinance incorporating certain rules and regulations for the installation of oil burners in Washington had been presented to the Commissioner and signed and put into effect, but the truth of the entire situation was so radically different from that portrayed by the report as to be distinctly humorous. In the first place, *there had been no epidemic of so-called oil-burner fires* or any other such reason to force the formulation of this ordinance. The committee that was responsible for working out the details of the ordinance was composed largely of representatives of oil-burner manufacturers and, in fact, these men were not only entirely satisfied with the ordinance as completed, but were instrumental in securing its passage as a matter of securing uniformity and eliminating, so far as might be possible, the installation of inferior burners in a careless way.

The last and not the least interesting point was the fact that *this ordinance had been in effect nearly a year* when the bulletin in question was printed and distributed and the news of this action was so stale as to be almost ancient history. The bulletin might as appropriately have contained the statement that "a few nights ago, a cow kicked over a lamp in the stable belonging to Mrs. O'Leary and, as a result, a large part of the business section of Chicago was destroyed by fire."

Why those interested in the sale of coal for domestic heating descend to such glaring misrepresentation of facts in order to tear down what they imagine to be a competing business is a mystery. As was the case in Washington, the necessity for the formulation of rules governing the installation of oil burners became apparent and was a matter of concern not only for the city authorities, but for those interested in the sale of oil burners of recognized worth.

As a matter of fact, it is undoubtedly "good business" for those selling the better class of oil burners in any community to get together and take the lead in securing the passage of such restrictions as are generally in force in the larger cities to-day. Unfortunately, it is true that ordinances pertaining to the installation of oil burners are not the same in all cities. While undoubtedly it is true that the restrictions that might logically be set down for the installation of oil burners in Oshkosh would not be properly protective in the city of New York, still there are certain basic principles that should be incorporated in every ordinance, and it is manifestly to the advantage of manufacturers of oil burners and their auxiliary equipment that these ordinances be as nearly uniform as possible.

In presenting a digest of the various ordinances, it has been thought best simply to brief them, so that only the vital portions are considered. These will be given in the exact phraseology of the ordinance where the essence may be lost by briefing.

A SUGGESTED STANDARD ORDINANCE

In first presenting the skeleton of an ordinance suggested as a standard or pattern, it is pointed out that it is not reasonable to provide ordinances of exact duplication in all cities. Conditions of housing, nationality of residents, zoning and existing building laws enter into the matter, and a certain degree of flexibility must be allowed.

The National Board of Fire Underwriters and the National Fire Protection Association have suggested this ordinance as a guide for those cities and towns desiring to formulate such an ordinance, with the intent of emphasizing the most important features and of securing, so far as may be possible, uniformity of idea and expression.

The desirability of any such ordinance lies mainly in the degree of protection provided for the population of the community, and the value of a uniform ordinance throughout the country is chiefly to the manufacturer of equipment that may be installed under the restrictions.

Proposed Standard Form of Ordinance Regulating the Construction and Installation of Oil-Burning Equipments and the Storage and Use of Oil Fuels Used in Connection Therewith.

Oil-burning equipments are those using only liquids having a flash point above 100° F. closed cup tester.

No oil-burning equipment shall be installed until an application has been filed with and a permit secured from the chief of the fire department. Application shall set forth in detail the specifications of the proposed installation . . . shall be accompanied by plans . . . to show the relative location of building, tanks, pumps, piping, and so forth, and shall include a sectional elevation of the building showing lowest floors or pits that limit allowable storage capacity, tanks, their fittings and devices, dikes, pumps, filling lines and burners.

Tanks located above ground and outside of a building shall be permitted only outside of closely-built districts and subject to the approval of the chief of the fire department after inspection of the premises.

MATERIAL OF TANKS

Tanks shall be constructed of galvanized steel, basic open hearth steel or wrought-iron or concrete. Steel or iron tanks shall have a minimum gauge (U. S. Standard) depending upon the capacity, as given in Tables 1 to 3, inclusive.

Concrete shall be permitted only for liquids of 35° A.P.I. and below, and shall be of design approved by the Superintendent of Buildings, and shall be built under a competent supervisor.

INFILTRATION

Stationary Wood Sash	25	French Doors	100
Double Hung Wood Sash	50	Outside Doors	200
Double Hung Steel Sash	100	Outside Doors with Storm Doors	100
Casement Windows	100	Outside Doors with	
Fenestra	100	Inner Vestibule Doors	100

Metal Weather Strip Deducts 50%

HEATING AND PIPING CONTRACTORS

STANDARD RADIATION ESTIMA

SHOWING RADIATION REQUIRED FOR QUA

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3 Col 38" St'm Rad	GLASS		INFILTRATION				OUTSIDE WALLS																	
	Win. or Door	Sky Light	Rate per Lin. Ft.				Plain Brick			Brick and Pl.			Brick Fur. L. P.			Br. 4" Tile Pl.			Plain Conc.			Conc. Fur L.	
			25	50	100	200	8"	12"	16"	8"	12"	16"	8"	12"	16"	4"	8"	12"	8"	12"	16"	8"	12"	
	1.1	1.3	0.45	0.9	1.8	3.6	.42	.32	.26	.38	.29	.25	.27	.23	.21	.30	.26	.22	60	.48	.41	.50	.40	
225	55.0	65.0	22.5	45.0	90.0	180	21.0	16.0	13.0	19.0	14.5	12.5	13.5	11.5	10.5	15.0	13.0	11.0	30.0	24.0	20.5	25.0	20.0	
1	4.09	3.46	10.0	5.00	2.50	1.25	10.7	14.1	17.3	11.9	15.5	18.0	16.7	19.6	21.4	15.0	17.3	20.5	7.50	9.38	11.0	9.00	11.3	
2	8.18	6.92	20.0	10.0	5.00	2.50	21.4	28.2	34.6	23.8	31.0	36.0	33.4	39.2	42.8	30.0	34.6	41.0	15.0	18.8	22.0	18.0	22.6	
3	12.3	10.4	30.0	15.0	7.50	3.75	32.1	42.3	51.9	35.7	46.5	54.0	50.1	58.8	64.2	45.0	51.9	61.5	22.5	28.1	33.0	27.0	34.9	
4	16.4	13.8	40.0	20.0	10.0	5.00	42.8	56.4	69.2	47.6	62.0	72.0	66.8	78.4	85.6	60.0	69.2	82.0	30.0	37.5	44.0	36.0	45.2	
5	20.5	17.3	50.0	25.0	12.5	6.25	53.5	70.5	86.5	59.5	77.5	90.0	83.5	98.0	107	75.0	86.5	103	37.5	46.9	55.0	45.0	56.5	
6	24.5	20.8	60.0	30.0	15.0	7.50	64.2	84.6	104	71.4	93.0	108	100	118	128	90.0	104	123	45.0	56.3	66.0	54.0	67.8	
7	28.6	24.2	70.0	35.0	17.5	8.75	74.9	98.7	121	83.3	109	126	117	137	150	105	121	144	52.5	65.7	77.0	63.0	79.1	
8	32.7	27.7	80.0	40.0	20.0	10.0	85.6	113	138	95.2	124	144	134	157	171	120	138	164	60.0	75.0	88.0	72.0	90.4	
9	36.8	31.1	90.0	45.0	22.5	11.3	96.3	127	156	107	140	162	150	176	193	135	156	185	67.5	84.4	99.0	81.0	102	
10	40.9	34.6	100	50.0	25.0	12.5	107	141	173	119	155	180	167	196	214	150	173	205	75.0	93.8	110	90.0	113	
11	45.0	38.1	110	55.0	27.5	13.8	118	155	190	131	171	198	184	216	235	165	190	226	82.5	103	121	99.0	124	
12	49.1	41.5	120	60.0	30.0	15.0	128	169	208	143	186	216	200	235	257	180	208	246	90.0	113	132	108	136	
13	53.2	45.0	130	65.0	32.5	16.2	139	183	225	155	202	234	217	255	278	195	225	267	97.5	122	143	117	147	
14	57.3	48.4	140	70.0	35.0	17.5	150	197	242	167	217	252	234	274	300	210	242	287	105	131	154	126	158	
15	61.4	51.9	150	75.0	37.5	18.8	161	212	260	179	233	270	251	294	321	225	260	308	113	141	165	135	170	
16	65.4	55.4	160	80.0	40.0	20.0	171	226	277	190	248	288	267	314	342	240	277	328	120	150	176	144	181	
17	69.5	58.8	170	85.0	42.5	21.3	182	240	294	202	264	306	284	333	364	255	294	349	128	159	187	153	192	
18	73.6	62.3	180	90.0	45.0	22.5	193	254	311	214	279	324	301	353	385	270	311	369	135	169	198	162	203	
19	77.7	65.7	190	95.0	47.5	23.8	203	268	329	226	295	342	317	372	407	285	329	390	143	178	209	171	215	
20	81.8	69.2	200	100	50.0	25.0	214	282	346	238	310	360	334	392	428	300	346	410	150	188	220	180	226	
21	85.9	72.7	210	105	52.5	26.3	225	296	363	250	326	378	351	412	449	315	363	431	158	197	231	189	237	
22	90.0	76.1	220	110	55.0	27.5	235	310	381	262	341	396	367	431	471	330	381	451	165	206	242	198	249	
23	94.1	79.6	230	115	57.5	28.8	246	324	398	274	357	414	384	451	492	345	398	472	173	216	253	207	260	
24	98.2	83.0	240	120	60.0	30.0	257	338	415	286	372	432	401	470	514	360	415	492	180	225	264	216	271	
25	102	86.5	250	125	62.5	31.3	268	353	433	298	388	450	418	490	535	375	433	513	188	235	275	225	283	

For Methods of Using Table See Back of Sheet.

INFILTRATION

Stationary Wood Sash	25	French Doors	100
Double Hung Wood Sash	50	Outside Doors	200
Double Hung Steel Sash	100	Outside Doors with Storm Doors	100
Casement Windows	100	Outside Doors with	
Fenestra	100	Inner Vestibule Doors	100

Metal Weather Strip Deducts 50%

HEATING AND PIPING CONTRACTORS

STANDARD RADIATION ESTIMA

SHOWING RADIATION REQUIRED FOR QUA

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3 Col 38" St'm Rad	GLASS		INFILTRATION				OUTSIDE WALLS																	
	Win. or Door	Sky Light	Rate per Lin. Ft.				Plain Brick			Brick and Pl.			Brick Fur. L. P.			Br. 4" Tile Pl.			Plain Conc.			Conc. Fur L.	
			25	50	100	200	8"	12"	16"	8"	12"	16"	8"	12"	16"	4"	8"	12"	8"	12"	16"	8"	12"	
	1.1	1.3	0.45	0.9	1.8	3.6	.42	.32	.26	.38	.29	.25	.27	.23	.21	.30	.26	.22	60	.48	.41	.50	.40	
200	55.0	65.0	22.5	45.0	90.0	180	21.0	16.0	13.0	19.0	14.5	12.5	13.5	11.5	10.5	15.0	13.0	11.0	30.0	24.0	20.5	25.0	20.0	1
1	3.64	3.08	8.90	4.44	2.22	1.11	9.52	12.5	15.4	10.5	13.8	16.0	14.8	17.4	19.0	13.3	15.4	18.2	6.67	8.33	9.75	8.00	10.0	1
2	7.28	6.16	17.8	8.88	4.44	2.22	19.0	25.0	30.8	21.0	27.6	32.0	29.6	34.8	38.0	26.6	30.8	36.4	13.3	16.7	19.5	16.0	20.0	2
3	10.9	9.24	26.7	13.3	6.66	3.33	28.6	37.5	46.2	31.5	41.4	48.0	44.4	52.2	57.0	39.9	46.2	54.6	20.0	25.0	29.3	24.0	30.0	3
4	14.6	12.3	35.6	17.7	8.88	4.44	38.1	50.0	61.6	42.0	55.2	64.0	59.2	69.6	76.0	53.2	61.6	72.8	26.7	33.3	39.0	32.0	40.0	4
5	18.2	15.4	44.5	22.2	11.1	5.55	47.6	62.5	77.0	52.5	69.0	80.0	74.0	87.0	95.0	66.5	77.0	91.0	33.3	41.6	48.8	40.0	50.0	5
6	21.8	18.5	53.4	26.6	13.3	6.66	57.1	75.0	92.4	63.0	82.8	96.0	88.8	104	114	79.8	92.4	109	40.0	50.0	58.5	48.0	60.0	7
7	25.4	21.6	62.3	31.0	15.5	7.77	66.6	87.5	108	73.5	96.6	112	104	122	133	93.1	108	127	46.7	58.3	68.2	56.0	70.0	8
8	29.0	24.6	71.2	35.5	17.7	8.88	76.2	100	123	84.0	110	128	118	139	152	106	123	146	53.4	66.6	78.0	64.0	80.0	9
9	32.8	27.7	80.1	39.9	19.9	9.99	85.7	113	139	94.5	124	144	133	157	171	120	139	164	60.0	75.0	87.8	72.0	90.0	
10	36.4	30.8	89.0	44.4	22.2	11.1	95.2	125	154	105	138	160	148	174	190	133	154	182	66.7	83.3	97.5	80.0	100	
11	40.0	33.9	97.9	48.8	24.4	12.2	105	138	169	115	152	176	163	191	209	146	169	200	73.4	91.6	107	88.0	110	
12	43.6	37.0	107	53.3	26.6	13.3	114	150	185	126	166	192	178	209	228	160	185	218	80.0	100	117	96.0	120	
13	47.3	40.0	116	57.7	28.8	14.4	124	163	200	136	179	208	192	226	247	173	200	237	86 7	108	127	104	130	
14	51.0	43.1	125	62.2	31.1	15.5	133	175	216	147	193	224	207	244	266	186	216	255	93.4	117	137	112	140	
15	54.6	46.2	133	66.6	33.3	16.6	143	188	231	157	207	240	222	261	285	200	231	273	100	125	146	120	150	
16	58.2	49.3	142	71.0	35.5	17.8	152	200	246	168	221	256	237	278	304	213	246	291	107	133	156	128	160	
17	61.8	52.4	151	75.5	37.7	18.9	162	213	262	178	235	272	252	296	323	226	262	309	113	142	166	136	170	
18	65.5	55.4	160	79.9	39.9	20.0	171	225	277	189	248	288	266	313	342	239	277	328	120	150	176	144	180	
19	69.1	58.5	169	84.4	42.2	21.1	181	238	293	199	262	304	281	331	361	253	293	346	127	158	185	152	190	
20	72.8	61.6	178	88.8	44.4	22.2	190	250	308	210	276	320	296	348	380	266	308	364	133	167	195	160	200	
21	76.4	64.7	187	93.2	46.6	23.3	200	263	323	220	290	336	311	365	399	279	323	382	140	175	205	168	210	
22	80.1	67.8	196	97.7	48.8	24.4	209	275	339	231	304	352	326	383	418	293	339	400	147	183	215	176	220	
23	83.7	70.8	205	102	51.0	25.5	219	288	354	241	317	368	340	400	437	306	354	419	153	192	224	184	230	
24	87.4	73.9	214	106	53.3	26.6	228	300	370	252	331	384	355	418	456	319	370	437	160	200	234	192	240	
25	91.0	77.0	223	111	55.5	27.7	238	313	385	262	345	400	370	435	475	333	385	455	167	208	244	200	250	

For Methods of Using Table See Back of Sheet

TORS NATIONAL ASSOCIATION
ESTIMATING TABLE
FOR QUANTITIES INDICATED

tion than that Shown SeeHeating and Piping Contractors National Association Engineering Standards.

ST. LOUIS

TEMPERATURE FACTORS		EXPOSURE FACTORS			
Room Temperature	$70°=T_1$	N	1.30	S	1.20
Base Temperature	$+20°=T_0$	NE	1.20	SW	1.20
Base Temp. +20° Equivalent to Guarantee Temp. of +5° Outside		E	1.00	W	1.30
		SE	1.20	NW	1.30

Conc. Fur L. P.			Frame Std.	Frame No Sh'g	Frame No L. P.	ROOF				Base Floor		Interm'e Floor			Ceiling		Partition			Type
8"	12"	16"				T&G on 1" Bd.	T&G on 4" Conc.	Sh'gle on Sh'g	Sh'gle Sh'g L. P.	Conc. on Earth	Wood on Sleep.	4" Conc.	4" Conc. 3" Fill 1" Fin.	Double Wood	Lath and Plas.	L & P Wo. Fl. Over	Stud L & P 1 Side	Stud L & P 2 Side		Kind
																				Thick.
.50	.40	.34	.24	.31	.35	.30	.60	.40	.30	.31	.13	.20	.15	.20	.49	.28	.60	.33		K
25.0	20.0	17.0	12.0	15.5	17.5	15.0	30.0	20.0	15.0	7.75	3.25	5.00	3.75	5.00	12.25	7.00	15.0	8.25		K(Ti-To)
.00	11.3	13.2	18.7	14.5	12.9	15.0	7.50	11.3	15.0	29.0	69.2	45.0	60.0	45.0	18.0	32.2	15.0	27.3		1
18.0	22.6	26.4	37.4	29.0	25.8	30.0	15.0	22.6	30.0	58.0	138	90.0	120	90.0	36.0	64.4	30.0	54.6		2
27.0	34.9	39.6	56.1	43.5	38.7	45.0	22.5	34.9	45.0	87.0	208	135	180	135	54.0	96.6	45.0	81.9		3
36.0	45.2	52.8	74.8	58.0	51.6	60.0	30.0	45.2	60.0	116	277	180	240	180	72.0	129	60.0	109		4
45.0	56.5	66.0	93.5	72.5	64.5	75.0	37.5	56.5	75.0	145	346	225	300	225	90.0	161	75.0	137		5
54.0	67.8	79.2	112	87.0	77.4	90.0	45.0	67.8	90.0	174	415	270	360	270	108	193	90.0	164		6
63.0	79.1	92.4	131	102	90.3	105	52.5	79.1	105	203	484	315	420	315	126	225	105	191		7
72.0	90.4	106	150	116	103	120	60.0	90.4	120	232	554	360	480	360	144	258	120	218		8
81.0	102	119	168	131	116	135	67.5	102	135	261	623	405	540	405	162	290	135	246		9
90.0	113	132	187	145	129	150	75.0	113	150	290	692	450	600	450	180	322	150	273		10
99.0	124	145	206	160	142	165	82.5	124	165	319	761	495	660	495	198	354	165	300		11
108	136	158	225	174	155	180	90.0	136	180	348	830	540	720	540	216	386	180	328		12
117	147	172	244	189	168	195	97.5	147	195	377	900	585	780	585	234	419	195	355		13
126	158	185	262	203	181	210	105	158	210	406	969	630	840	630	252	451	210	382		14
135	170	198	281	218	194	225	113	170	225	435	1038	675	900	675	270	483	225	410		15
144	181	211	300	232	206	240	120	181	240	464	1107	720	960	720	288	515	240	437		16
153	192	224	318	247	219	255	128	192	255	493	1176	765	1020	765	306	547	255	464		17
162	203	238	337	261	232	270	135	203	270	522	1246	810	1080	810	324	580	270	491		18
171	215	251	355	276	245	285	143	215	285	551	1315	855	1140	855	342	612	285	519		19
180	226	264	374	290	258	300	150	226	300	580	1384	900	1200	900	360	644	300	546		20
189	237	277	392	305	271	315	158	237	315	609	1453	945	1260	945	378	676	315	573		21
198	249	290	411	319	284	330	165	249	330	638	1522	990	1320	990	396	708	330	601		22
207	260	304	430	334	297	345	173	260	345	667	1592	1035	1380	1035	414	741	345	628		23
216	271	317	449	348	310	360	180	271	360	696	1661	1080	1440	1080	432	773	360	655		24
225	283	330	467	363	323	375	188	283	375	725	1730	1125	1500	1125	450	805	375	683		25

←——These Items Figured on Basis of K $\left(\frac{T_i - T_o}{2}\right)$ ——→

ORS NATIONAL ASSOCIATION
ESTIMATING TABLE
OR QUANTITIES INDICATED

on than that Shown SeeHeating and Piping Contractors National Association Engineering Standards.

DENVER

TEMPERATURE FACTORS		EXPOSURE FACTORS			
Room Temperature	$70°=T_1$	N	1.30	S	1.25
Base Temperature	$+20°=T_0$	NE	1.30	SW	1.25
Base Temp. +20° Equivalent to Guarantee Temp. of +5° Outside		E	1.20	W	1.00
		SE	1.25	NW	1.30

nc. Fur L. P.			Frame Std.	Frame No Sh'g	Frame No L. P.	ROOF				Base Floor		Interm'e Floor			Ceiling		Partition			Type
"	12"	16"				T&G on 1" Bd.	T&G on 4" Conc.	Sh'gle on Sh'g	Sh'gle Sh'g L. P.	Conc. on Earth	Wood on Sleep.	4" Conc.	4" Conc. 3" Fill 1" Fin.	Double Wood	Lath and Plas.	L & P Wo. Fl. Over	Stud L & P 1 Side	Stud L & P 2 Side		Kind
																				Thick.
0	.40	.34	.24	.31	.35	.30	.60	.40	.30	.31	.13	.20	.15	.20	.49	.28	.60	.33		K
.0	20.0	17.0	12.0	15.5	17.5	15.0	30.0	20.0	15.0	7.75	3.25	5.00	3.75	5.00	12.3	7.00	15.0	8.25		K(Ti-To)
00	10.0	11.8	16.7	12.9	11.4	13.3	6.67	10.0	13.3	25.8	61.5	40.0	53.3	40.0	16.3	28.6	13.3	24.2		1
.0	20.0	23.6	33.4	25.8	22.8	26.6	13.3	20.0	26.6	51.6	123	80.0	107	80.0	32.6	57.2	26.6	48.4		2
.0	30.0	35.4	50.1	38.7	34.2	39.9	20.0	30.0	39.9	77.4	185	120	160	120	48.9	85.8	39.9	72.6		3
.0	40.0	47.2	66.8	51.6	45.6	53.2	26.7	40.0	53.2	103	246	160	213	160	65.2	114	53.2	96.8		4
.0	50.0	59.0	83.5	64.5	57.0	66.5	33.3	50.0	66.5	129	308	200	267	200	81.5	143	66.5	121		5
.0	60.0	70.8	100	77.4	68.4	79.8	40.0	60.0	79.8	155	369	240	320	240	97.8	172	79.8	145		6
.0	70.0	82.6	117	90.3	79.8	93.1	46.7	70.0	93.1	181	431	280	373	280	114	200	93.1	169		7
.0	80.0	94.4	134	103	91.2	106	53.4	80.0	106	206	492	320	426	320	130	229	106	193		8
.0	90.0	106	150	116	103	120	60.0	90.0	120	232	554	360	480	360	147	257	120	218		9
.0	100	118	167	129	114	133	66.7	100	133	258	615	400	533	400	163	286	133	242		10
.0	110	130	184	142	125	146	73.4	110	146	284	677	440	586	440	179	315	146	266		11
.0	120	142	200	155	137	160	80.0	120	160	310	738	480	640	480	196	343	160	290		12
04	130	153	217	168	148	173	86.7	130	173	335	800	520	693	520	212	372	173	314		13
12	140	165	234	181	160	186	93.4	140	186	361	861	560	746	560	228	400	186	339		14
20	150	177	250	194	171	200	100	150	200	387	923	600	800	600	245	429	200	363		15
28	160	189	267	206	182	213	107	160	213	413	984	640	853	640	261	458	213	387		16
36	170	201	284	219	194	226	113	170	226	439	1046	680	906	680	277	486	226	411		17
44	180	213	301	232	205	239	120	180	239	464	1107	720	959	720	293	515	239	436		18
52	190	225	317	245	217	253	127	190	253	490	1169	760	1013	760	310	543	253	460		19
60	200	236	334	258	228	266	133	200	266	516	1230	800	1066	800	326	572	266	484		20
68	210	248	351	271	239	279	140	210	279	542	1292	840	1119	840	342	601	279	508		21
76	220	260	367	284	251	293	147	220	293	568	1353	880	1173	880	359	629	293	532		22
84	230	271	384	297	262	306	153	230	306	593	1415	920	1226	920	375	658	306	557		23
92	240	283	401	310	274	319	160	240	319	619	1476	960	1279	960	391	686	319	581		24
00	250	295	418	323	285	333	167	250	333	645	1538	1000	1333	1000	408	715	333	605		25

←——These Items Figured on Basis of K $\left(\frac{T_i - T_o}{2}\right)$ ——→

TABLE 1.—UNDERGROUND TANKS

Capacity, gallons.	Minimum Thickness of Materials, Gauge
1 to 560	14
561 to 1100	12
1101 to 4000	7
4001 to 10500	¼ in.

UNDERGROUND TANKS (ISOLATED)

In outlying districts to be prescribed by the chief of the fire department, tanks not exceeding 1100 gal., if located 10 ft. or more from any building, may be constructed as follows:

Capacity, gallons.	Minimum Thickness of Materials, Gauge
1 to 30	18
31 to 350	16
351 to 1100	14

CONSTRUCTION OF TANKS

Tanks shall be . . . made tight in a mechanical manner . . . shall be covered with asphaltum or other non-rusting paint or covering. All pipe connections shall be made through flanges or reinforced metal.

FOUNDATION OF TANKS

Metal tanks shall be constructed entirely of metal.

All metal tanks shall be electrically grounded to permanent moisture to the satisfaction of the chief of the fire department. No insulated connections shall be permitted.

Tanks more than 1 ft. above the ground, must have foundation and supports of non-combustible materials, except wooden cushions.

NO CONNECTIONS TO DRAINS

No connections between tanks and house or sub-surface drainage systems shall be permitted unless properly constructed inflammable fluid collectors are provided in such connection.

VENT PIPE

All storage systems in which the tank may contain imflammable gases, shall have at least a 1-in. vent pipe, run from top of tank to a point outside of building, and acceptable to the chief of the fire department. A combined vent and filling pipe, so equipped and located as to vent the tank at all times, even during filling operations, may be used.

FILLING PIPE

End of filling pipe in tank shall be turned up to form a trap or seal . . . terminal shall be outside of building in a tight incombustible box or casting . . . so designed as to make access difficult by unauthorized persons.

TEST WELL OR GAUGING DEVICES

Gauging devices or test wells, the breakage of which would permit the escape of oil or vapor within the building, are prohibited.

SETTING OF UNDERGROUND TANKS

Tanks shall be buried underground with top of tanks not less than 3 ft. below the surface of the ground, except that in lieu of the 3-ft. cover, tank may be buried under 18 in. of earth and a cover of reinforced concrete, at least 6 in. in thickness provided, which shall extend at least 1 ft. beyond the outline of the tank in all directions.

Where a tank cannot be entirely buried, it shall be covered over with earth of a depth of at least 3 ft., and sloped on all sides, slopes to be not less than 3 to 1.

When located underneath a building, the tanks shall be buried with top of tanks not less than 2 ft. below the level of the floor. The floor immediately above these tanks shall be of reinforced concrete at least 9 in. in thickness, or some other type of construction of equivalent strength and fire resistance, and extending at least 1 ft. beyond the outline of the tank in all directions.

Each above-ground tank, over 100 gal. in capacity shall have all man-holes, vent openings and other openings which may emit inflammable vapor, provided with a 40 x 40 mesh non-corrodible wire screen, or its equivalent.

CONSTRUCTION AND INSTALLATION OF GRAVITY AND PRESSURE TANKS

Supply tanks feeding burners directly by gravity or by pressure on the tanks shall not exceed a capacity of 60 gal. If located within the building, gravity tank shall not be within 5 ft., or pressure tank within 10 ft., measured horizontally, from any flame or fire. Such tanks shall be rigidly installed on incombustible supports. Tanks for systems under pressure shall be designed for 6 times the maximum working pressure. Working pressure shall not exceed 60 lbs. Such tanks shall be provided with reliable pressure gauge and with an automatic relief valve.

Tanks shall be filled by pumping from storage tank, or if gravity or pressure tank contains the entire storage, filling pipe shall extend to and terminate outside of the building . . . and in such cases shall be so installed that in case of overflow, oil will not enter the building.

Tanks supplied by pumping shall be provided with an overflow connection draining to storage tank. Overflow pipe shall be not less than one size larger than supply pipe from pump.

INSULATION OF TANKS INSIDE OF BUILDINGS

Tanks shall not be located above the lowest story cellar or basement of building.

Steel tanks exceeding a capacity of 200 gal. shall be completely enclosed with a heat insulation equivalent to reinforced concrete not less than 12 in. in thickness, with at least 6-in. spaces on sides between tank and concrete insulation filled with sand or well tamped earth, and with 12 in. of sand filling the spaces between the top of the tank and underside of concrete slab.

PIPING

All piping shall be of standard full-weight brass, wrought-iron or steel for working pressures less than 100 lbs. No piping less than ½ in. internal diameter shall be permitted.

In all pipe systems, proper allowance shall be made for expansion and contraction, jarring and vibration.

The use of tubing of any kind is prohibited.

When oil is pumped to the burner, return pipes shall be at least the same size as the feed line.

All connections shall be made perfectly tight with well fitted joints made up with litharge. Unions shall be used at burners to facilitate removal. All unions shall be of approved type, having conically faced joints, obviating the use of packing or gaskets. No right and left couplings shall be used.

TESTS

Piping shall be tested and proven tight at pressure 50% in excess of the working pressure, but in no case less than 50 lbs. per square inch.

VALVES

Readily accessible shut-off valves shall be provided on both sides of any strainer which may be installed in pipe lines; in discharge and suction lines to pump; in discharge and return lines to any tank as near tank as practicable and in branch lines near burners. An outside readily-accessible valve shall be provided on all supply lines entering the building.

BURNERS

The burner mechanism shall be so designed as to not enlarge the orifice, and so that the needle valve can not be unscrewed and removed in operating. The size of the orifice through which the oil is supplied to the burner shall be limited to furnish only sufficient oil for maximum burning conditions when the control valves are wide open.

No burner shall be used unless of a type and design approved by the chief of the fire department.

AUTOMATIC SYSTEMS

Automatic systems and systems where a competent attendant is not on duty in the boiler room or furnace room at all times shall be so designed that the flame can not be extinguished by operation of the automatic control valve, or a gas pilot light shall be provided in

the combustion chamber. Such systems shall be provided with suitable automatic safeguards to prevent abnormal discharge of oil at the burners.

FURNACE OR RANGES

Previous to the installation of the burner, the ash door of the furnace shall be permanently removed, or bottom ventilation otherwise provided to prevent the accumulation of vapors within the ash pit.

No damper shall be permitted in the chimney uptake that may entirely shut off passage of fumes or gases up the flue.

FIRE PROTECTION

Any woodwork, wooden lath and plaster partition, or other combustible material within 4 ft. of the sides or back, or 8 ft. from the front of the furnace shall be covered with approved plaster board or other approved incombustible material. Above the furnace there shall be constructed a ceiling consisting of plaster board covered with sheet metal or cement plaster on metal lath; said ceilings shall extend 4 ft. beyond the sides and back and 8 ft. from the front.

At least a 36-in. clearance shall be provided between top and sides of breeching and flues from ceilings, partitions and other combustible material, unless such breechings and flues are insulated with at least 2 in. of asbestos or magnesia lagging or equivalent, in which case the clearance may be reduced to 18 in.

Near the entrance to the furnace room, and so located as to be convenient for use in emergency, there shall be provided a hand extinguisher of approved type suitable for use on oil fires.

INSTRUCTION CARD

A card giving complete instruction in regard to the care and operation of the system shall be permanently posted near the apparatus.

INSTALLATION

Oil-burning equipment shall be installed only by properly qualified mechanics experienced in this kind of work; such equipment shall preferably be installed by the manufacturer.

Any person or persons, firm or corporation violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and be fined not less than $5.00 and not more than $25.00 for each day's neglect of compliance.

1926 CATALOGUE OF PRACTICAL, SCIENTIFIC MECHANICAL AND INDUSTRIAL BOOKS, has been issued by the Norman W. Henley Publishing Co., 2 West 45th St., New York. Books on heating subjects listed "Practical Steam, Hot Water Heating and Ventilation", "Questions and Answers on Steam, Hot Water, Vapor and Vacuum Heating Practice," and "Examination Outfit for Fitters," all by Alfred G. King. Size 3 x 6 in. Pp. 48.

Handling Exhaust Gases from Gas Engines to Prevent Vitiation of Air

Machinery Driven by Gas Engines in Tent with Exhaust Carried Underground to Outside

THE old adage that "necessity is the mother of invention" is well borne out in reports of the means provided for taking care of the exhaust gases from automobiles and other types of gas engines where their operation would be likely to affect the occupied interiors or enclosures.

During the All-Western Road Show, for instance, held in San Francisco, last November, which occupied five large tents, many of the machines on display in the tents were in actual operation. This was a great advantage because a machine in operation is far more interesting than a "dead" exhibit, which is the usual condition, when such exhibits are held in buildings.

The danger of air contamination, even in tents, is an important factor. As shown in the accompanying illustration, the machine in the foreground, which was in operation during the entire period of the show, was kept running due to the fact that a large pipe was connected with the engine exhaust, and was carried underneath the ground to a point outside of the tent.

In another case, where it was necessary to remove the exhaust gases from automobiles in the new car department of the Howard Automobile Company, in San Francisco, an overhead duct was installed, to which was connected several lengths of flexible hose, each one about 20 ft. in length. One end of each hose was provided with a bushing to fit over the end of the exhaust pipe from an automobile, with a thumb screw for holding the bushing tightly in place.

In this way it was possible to have the engines of a score of cars running in the room without deleterious effects.

A similar arrangement is reported where it was desired to operate the engine of a car for demonstration purposes in an automobile salesroom. The accompanying illustration shows how a flexible pipe was extended along the floor, passing outdoors, as shown at the right of the illustration.

From a point immediately outside of the building the exhaust pipe was run in concrete below the sidewalk, terminating at the gutter.

Method of Exhausting Gases Through Flexible Hose Connected to Overhead Duct

How Car was Operated in Demonstration Room Through Use of Flexible Exhaust Pipe

Correspondence

Conducted by T. W. Reynolds

Violent Fluctuation in Boiler Water-Line and Its Cause

EDITOR HEATING AND VENTILATING MAGAZINE:

I have a problem which appears to be rather difficult to solve. The question is "What causes the violent and great fluctuation of the water line, and, failure to heat in a steam boiler when the water is at the arrow marking of the manufacturer?" This is really two questions in one. The lowering of the water level allows of heating, but does not stop the violent and great fluctuation of the water level.

The boiler is a new one but the system is seven years old. The brighter the fire the greater the fluctuation of the water level, etc. When the water is kept at the level as marked by the manufacturer's arrow but little heat is supplied. The regulator chokes, gurgles and fluctuates, causing a rapid movement of the chain connected to the ash-pit draft door. I took off the safety-valve and observed the action of the water in the dome. As the steam was released from the water and the water level lowered, that is, as the steam "puffed up," the water level receded in the glass, showing a geyser-like action. This action was observed in a more or less regular rhythm. If the water level, as stated, was kept at the manufacturer's level, the rhythmic action of steam puffs and quiescence was so great as to prevent sufficient delivery of steam into the mains. Consequently the water level had to be lowered to allow space in the dome for steam instead of water.

The fluctuation of the water level appears to be about 4 in. even with a moderate fire, so I had the water column and gauge glass permanently lowered. I also had a "circulation" pipe installed leading from the lowest part of dome to the return opening at bottom of fire-pot section. I thought that the rising "geyser-like" colums of water could spread out in the dome after delivering their steam and flow back to the bottom of boiler. This return flow I thought would prevent the upward currents from "fighting" against the downward currents, thus establishing a circulation sufficient to prevent the overflowing geyser-like action caused by opposing currents striving for mastery. But the only relief appears from a lowering of the entire water level about 2½ in. below the manufacturer's arrow. The boiler does not heat-up in the morning as rapidly as it should, that is, supply steam in rapid and sufficient manner to the radiation.

I am showing rough sketch (Fig. 1) of the boiler. Sufficient information can be obtained from this to give you a clear idea of the boiler. It has two nipples in each section. Does the "third" nipple aid in the circulation and prevent a geyser-like action and "fighting" of upper and lower currents for mastery? The water in the boiler has practically no oil apparent on it. I am familiar with the use of soda-ash, caustic soda, solution of lime, etc., for dirt, oil removal, etc.

I will be glad to have you give me your opinion on the above, letting me know where the trouble lies, whether it is inherent in the build of the boiler or whether there is some other cause.

WM. LAFONTAINE.

Scranton, Pa.

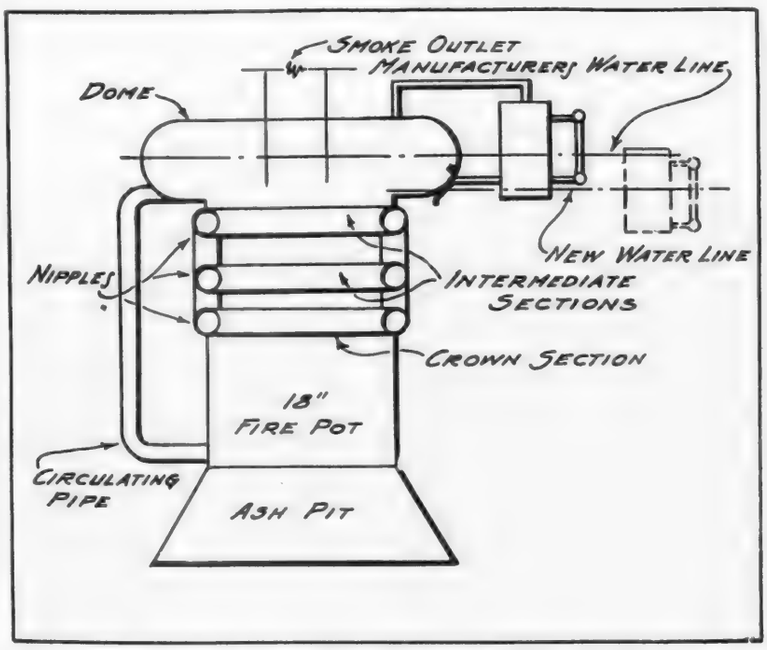


Fig. 1. Sketch of Boiler Installation Which Gave Trouble Through Violent Fluctuation of Water Line

The effect of lowering the water line, as done by the correspondent, would be to allow more steam space and a chance for the steam to escape above the waves within the boiler which sometimes reach such a height in troublesome boilers as to effectually block the outlet to the passage of steam. After all, the trouble may be only the oft-occurring priming and foaming from dirty water, the usual symptoms* of which are here present. In this connection, it has been written before in these columns and is here repeated that most unsteady water lines are caused by dirty water, even though the boiler may have been recently cleaned out. Many a dollar has been spent in costly experimentation in support of some other theory.

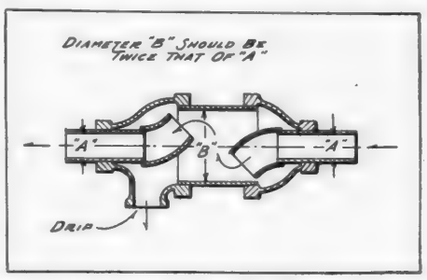


Fig. 2. A Kink for Preventing Priming Troubles

It is true that this is not a new system, nevertheless fish oil and core sand have been used in casting the boiler and scale in the old pipes may have been loosened in making new connections. This sometimes happens in old systems where the boiler being new is less incrusted, therefore has more "pep." It picks up quicker and loosens the scale from expansion and contraction throughout the system.

There is a quick way to prove the condition of the water. Just draw off a little water from the gauge glass into a sauce pan, say about full, and then observe its action while boiling over a gas plate, as compared to clean water boiled in the same manner. If it foams, lifts and boils rather violently it is dirty. If so, for the sake of further comparison note how a little clean water will act in the same pan when a bit of salt (salt is an alkali), butter or soap is added to make it foam.

*Just how these were observed through a ¼ in. safety valve opening when looking into a steam dome full of vapor is not clear.

Priming may also be caused by insufficient steam space, not enough disengagement surface, and small water passages; but probably the most important of all, by the steam outlets, if too small in size and number, or because of their slight distance above the water line of the boiler.

Third-nipple construction aids in the circulation of water within the boiler, thus giving it a good "pick-up" capacity. This does not mean that all two-nipple boilers are no good. Some boiler manufacturers make only three-nipple boilers, others make both two and three-nipple, the latter costing more, while still others use only one nipple. These nipples are made of large size so as not to obstruct circulation. Of course, the greater the total area of the nipples the better the circulation, for the same reason that a horizontal sectional boiler circulates better than a round or upright boiler. The circulation in the above respect is least impeded, therefore best of all in the steel boiler.

The trouble referred to may be caused or at least increased due to overloading. High load and high water level*, particularly when the load is suddenly applied, usually cause large amounts of boiler water to be taken out through the steam nozzle. If the new boiler has the same size of fire pot as the boiler it replaced it probably has the same capacity, but if its rating is the same as the first boiler, it is a smaller boiler, as ratings have increased within the last few years (in some cases 100%) without any increase in the capacity of the boiler.

In most cases of priming, trouble can be averted by arranging the piping from the outlets so as to drop into a steam header, the ends of which are dripped into the return header at the boiler, or a separator may be made up of pipe and fittings and installed in the steam main with a drip to the return header (See Fig. 2). In this way any water carried over will be prevented from entering the system. There are also a few good liquids which may be obtained for cleaning out the boiler in a few minutes without the trouble or expense of labor for emptying and refilling the system. They are not advertised and are used by certain manufacturers only in connection with the boilers they sell.

*The water level may not actually be as high as shown. It is believed that the sketch is exaggerated in some respects. The dome probably overlaps the body less than shown and should be higher in proportion to the rest of the sketch.

Painting Radiators for Greatest Efficiency

EDITOR HEATING AND VENTILATING MAGAZINE:

A boiler has been installed and is in good working condition, the radiators being left the way they came. Will these same radiators radiate more heat if painted with gold or silver? If so, how much? The radiators are black now, is this just as satisfactory?

Brooklyn, N. Y. D. A. TURNQUIST.

No, they will radiate less heat. On the other hand, as shown in the following table, if painted black they will transmit 6% more heat than when left bare, 27% more heat than when painted aluminum bronze and 24% more heat than when painted gold bronze; aluminum, copper or other metal pigments in the bronzes reducing the heat transmission, as metals have a poor radiating effect. This table gives the total heat transmitted from the radiator by means of radiation and convection.

240 B.T.U. Bare
200 B.T.U. Aluminum Bronze
205 B.T.U. Gold (Copper) Bronze
254 B.T.U. Black

These figures are derived from tests using 2-col. 38-in. high radiators of ten sections each and would vary slightly for radiators having a comparatively small radiating surface in proportion to convecting surface, such as 4-col. radiators. The effect would be more noticeable in pipe or wall coils where the surfaces are further apart and the proportionate amount of radiating surfaces somewhat greater.

Radiant heat is only about 30% of the total heat emitted in the case of a 2-col. radiator, the rest being given off by convection to the air passing over the radiating surfaces; consequently the effect of painting various colors is not so marked as it would be were the convective heat also affected. In some cases, such as in indirect heating, the effect would be negligible, as practically all of such heating is accomplished by air currents.

In general, it should be remembered that radiation is greater for rough or dark-colored surfaces than for smooth or light-colored ones, lampblack being the best radiator of heat, brass or silver (polished) the best reflectors. For example, bare bright tin pipes of a warm-air heating system being reflectors, lose less heat than when covered with asbestos paper in any number of thicknesses not over seven. It is interesting to note that dust increases the heat loss on such surfaces, if bare, but decreases the loss on these surfaces when insulated. Likewise, dark colors add much more to the heat loss from tin pipes without insulation than they add to the loss from insulated pipe. Still other points to remember are that rusty radiators give off more heat than clean bare radiators, that the results obtained in painting a radiator are dependent solely upon the last coat, that paints giving a matte surface are better radiators than high gloss paints and that all paints having finely-ground pigments give about the same radiating effect.

PRACTICAL REASONS WHICH DETERMINE THE COLOR SELECTED

In actual practice there are so many factors that affect the heat transmission of a radiator, irrespective of its color, such as location, enclosure, dust on the radiator, etc., that very little thought is given to painting the radiator a color giving maximum heat transmission.

As a general rule, the color used in painting radiation and piping is selected for its lasting qualities and ability to harmonize with the surroundings—advantages which in most cases outweigh many times the disadvantage of lower heat transmission. For example, a radiator placed alongside of a red brick wall would be painted green or black if it were required that its presence be subdued, but if it were desired that the radiator stand out it would be painted, say, aluminum or gold.* A compromise between these two extremes can be effected, as for example, where the walls are painted a cream color. In such cases, the radiator can be painted the same color, but the monotony of the one color can be interrupted and the appearance of the radiator made a bit more prominent and pleasing to the eye by painting the ribs of the radiator sections a deeper shade of the same color. A cream color running to gold at the ribs is another example of the above practice.

Two or three coats of paint are necessarily applied to a radiator. The first is the filler. If this were not used the final coat would peel, curl or flake off like a layer of celluloid from the varying rate of expansion and contraction between metal and paint. It is best to apply the paint while the surface is hot. If applied on a cold surface it will come off as the metal expands, but when applied on a hot surface it will stay when the metal contracts. It is also best to specify that the priming or first coat be done at the factory, as this will insure painting all over. It is difficult to paint the back of a radiator, once it is in place, so that this portion of the surface is often slighted. Gray or any light color is a good color for the priming coat.

*These are not paints in the true sense of the word, simply a mixture of banana oil and aluminum or gold. They are less liable to peeling or flaking off than are the paints.

Burning Salt to Clean a Flue

EDITOR HEATING AND VENTILATING MAGAZINE:

I have been told that unless one throws half a bag of salt into the fire every two weeks he is likely to have a fire from a blocked-up flue. Is there any truth in this statement, and if so, why does the salt act this way?

Brooklyn, N. Y. D. A. T.

Yes, because the chemical action due to the combination of salt with the flue gases loosens up the soot. The same result can be obtained by firing a blank cartridge up the flue, or by throwing a little powder on the fire, the rapidly-expanding gases caused by the explosion clearing the flue by their rush or high velocity through the flue to the outside.

In either case, once a year is enough. These are old remedies, though they may seem fanciful. Of course, if powder is used, discretion must be exercised, else once a year may be more than enough.

The Elimination of the Steam-Type Radiator

EDITOR HEATING AND VENTILATING MAGAZINE:

Why the Hearstian headlines in the May issue of your estimable journal, anent the "Knell of the Steam-Type Radiator"?

For more than twenty years we have been limited to one type of 4-col. radiation, irrespective of whether it was to be used for steam or water, except as regards the location of the air vent.

For more than twenty years we have been installing millions of feet of wall radiation, which is distinctly a water type; probably over 90% of it has been used in steam systems—one-pipe and two-pipe—and yet no one has ever bothered to ask whether it could be done or not.

Ever since vapor systems came into vogue—and vapor systems are nothing more or less than low-pressure steam systems—most engineers have believed that the water-type radiator was by far the more desirable pattern for this service.

In view of all this, one can but wonder who are the intelligent members of the heating profession who have doubted the possibility of using water-type radiation for steam; and what, after all these years, has implanted that doubt in their minds.

For over a hundred years we have known that air is 50% heavier than steam of the same pressure and temperature. The same common sense that has directed us to place the air vent at the top of a hot water radiator, has told us that if we wish to drain out of the steam radiator something that is heavier than the steam, we should place the vent at the bottom. Citing again the vapor system, we locate the air vent not merely near the bottom of the radiator, but even one, two, three or more stories below it, in the basement of the building.

I have no desire to belittle research, but I am unable to get much of a thrill from the proof that it is really possible to do something that we have been doing successfully for a quarter of a century.

The steam-type radiator has persisted in the 2-col., 3-col. and, to some extent, in the 1-col. patterns, largely because it did its job equally as well as the water type, and cost slightly less. Its "Death Knell" could have been rung just as loudly and effectively long ago, if the manufacturers had by agreement raised the price to the same level as that of the water type. In these enlightened days, however, such crude strong-arm methods are not to be tolerated, even in the sacred interest of standardization.

The proposal to abandon the steam-type of radiator is a most desirable step in the direction of eliminating unnecessary products. To the best of my knowledge it originated with the Heating and Piping Contractors' National Association and *all* of the credit belongs to that body.

Possibly the belated "research" is the only ethical and legal means that can be used to accomplish this desirable end, without the risk of getting involved in "illegal combinations in restraint of trade."

HENRY E. LONGWELL.

New York.

Series of Radio Talks on Heating

RADIO talks by prominent Chicago executives are planned as the result of a meeting recently held in that city, following the suggestion of Leo P. Reynolds, advertising counsel. Those back of the movement represent industries engaged in selling better heating service to the public. A program of talks will be arranged, each group to be represented by one of its members. The talks are to be non-commercial and untechnical and every effort will be made to have them of interest and of educational value to the general public.

Certified heating will be explained by representatives of the Master Steam Fitters' Association. The employment of competent heating counsel by the home-builders will be advocated by a representative of the Illinois Chapter of the American Society of Heating and Ventilating Engineers. The public will be advised regarding proper, economical and precautionary methods in the care and operation of heating plants by a representative of the Master Steamfitters' Association. Oil-burning for the home will be discussed by a representative of the Chicago Oil Burner Association.

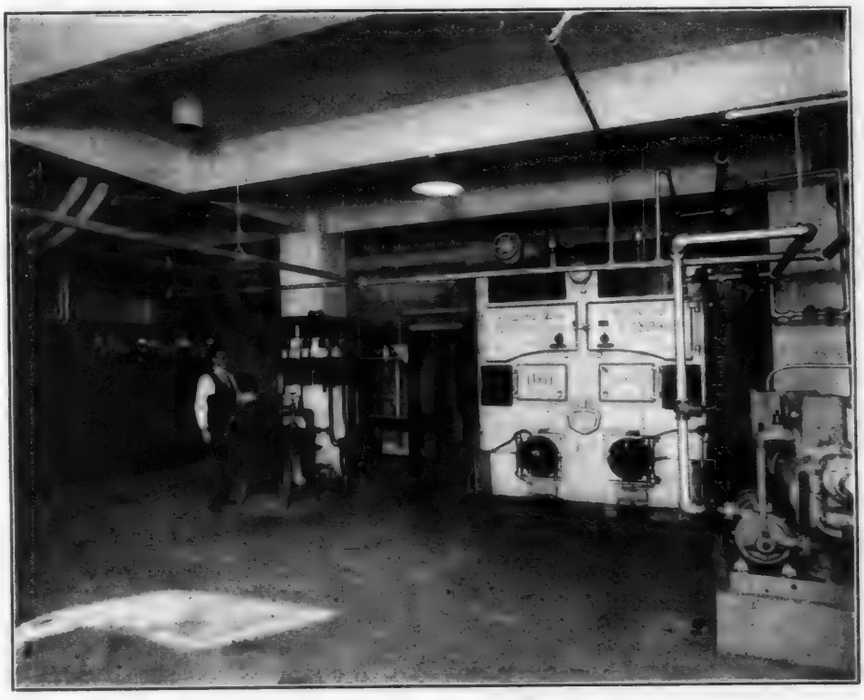
It is also the intention of this group to provide for the publication of informative pieces of literature to be sent upon request from radio audiences. It was decided to extend an invitation to the coal and gas industries to participate in the program so that the various interests engaged in furnishing fuels for domestic use might be represented.

The organization was effected by J. L. McCormack, American Oil Burner Association; E. P. Fahey, Chicago Oil Burner Association; T. I. Magan, Chicago Master Steam Fitters' Association; A. B. Martin, Illinois Chapter, American Society of Heating and Ventilating Engineers; Leo P. Reynolds, advertising counsel; and Cliff W. Presdee, western manager of THE HEATING AND VENTILATING MAGAZINE.

Typical Oil-Burning Equipment in a Western Building

In what is described as the country's finest automobile club service building, that of the California State Automobile Association in San Francisco, the equipment includes a steam heating system, the boilers being of the water-tube type, equipped with oil burners.

Both the heating plant and the main electric light and power switchboard are located in a specially walled room in the basement.



Boiler Installation in Service Building of the California State Automobile Association

Legal Decisions

Ownership and Expense of Lateral Steam Mains—North Dakota Commission Rules

The North Dakota Board of Railroad Commissioners in 1920 promulgated rules, effective November 1, 1920, governing the operation of steam-heating plants, called "Standards of Central Station Steam-heating Service." Rules 10 and 11 of these standards provided (Rule 10, Mains) that "the utility shall own and maintain all mains, manholes, connections and other appurtenances thereto in the streets or public highways," and (Rule 11, Services) that "the utility shall own and maintain all services and connections up to and including the service valve." It was also provided by Rule 11 that where the utility did not own the property described in these rules, it should obtain possession of it, paying therefor a fair and reasonable price mutually agreed upon by the utility and the owner, due allowance being made for depreciation. If utility and owner could not agree as to the price, the commission should fix a fair and reasonable price.

In 1925 certain steam-heat customers of the Ellendale Electric Company who had constructed lateral steam mains to their premises prior to the adoption of the 1920 rules, under contracts with the utility, after demand filed with the utility for the purchase of these mains and connections as provided by the rules, applied to the commission for an adjustment. The company contended that the commission was without jurisdiction, the matter being covered by the prior contracts between the parties. It appeared that before the adoption of Rules 10 and 11 all parties were required to pay for lateral mains from the centre of the street; but that after the adoption of the rules the utility had made the connections at its own expense, as required by the rules. The petitioners alleged that this constituted discrimination in favor of new consumers and against them. The utility moved for a dismissal of the applications for the reasons that to compel it to purchase the mains would be to impair the obligation of the contracts, and would result in the taking of private property without due process of law. The commission said:

"The motion of counsel for the utility raises several interesting questions, but there is, in fact, only one issue to decide, namely, may the commission lawfully require the utility to purchase from a consumer lateral steam mains and connections? It is not the function of the commission to interpret contracts. Clearly that is a matter for the courts. We may, however, take notice of the existence of a contract and determine its limitations upon our jurisdiction. In the instant case it is not denied that the contracts were valid when made and that they are still in effect. The petitioners wanted steam service and were apparently of the opinion that the only way they could get service was to enter into the contracts referred to. Could the commission require the utility to purchase the mains in question if no contracts were entered into? May the commission require by rule or order that the company own all the property used and useful in furnishing public utility service? May a consumer be required to furnish any part of the mains not located on his immediate premises? These are some of the questions that suggest themselves.

"A review of the leading cases decided by other commissions amply supports the view that we may require a utility to own and maintain all the plant and equipment. An exception to this rule would apply in cases where an extension was requested to be made in an undeveloped territory where the revenues to be derived from sales would yield little or no return upon the investment. In such cases the commission may properly apportion the cost of the extension between the utility and the consumer."

The commission believes it essential to the welfare of the community that a public utility should own and maintain, so far as is practicable, all the plant and equipment, especially equipment located in the streets and alleys of a city where it is operating under franchise. Where the ownership of steam-heating mains is vested in a number of private citizens it is practically impossible to police the lines. Should the lateral mains leading to any of the petitioners' buildings become serviceable, for any reason, the welfare of other citizens would be at stake. And the petitioners had no legal right to use the streets and alleys, whereas authority had been granted to the utility by its franchise.

It was held that to order compliance with Rule 10 and 11 would not impair the obligation of the prior contracts, because contracts must be understood as made in reference to the possible exercise of the rightful authority of the government and no obligation of the contract can extend to defeat the legitimate government authority, and neither the "contract clause" nor the "due process" clause of the federal Constitution has the effect of overriding the State's power to establish all the regulations reasonably necessary to secure the health, safety, or general welfare of the community.

It was also held that the enforcement of Rule 11 could not result in the taking of property without due process of law, because the Public Utility Act safeguards against that by providing for appeal to the courts from any order of the commission; and the utility is entitled to a fair return upon its investment and has recourse to the commission at all times.

A rule or practice of a utility requiring one consumer to provide lateral mains at his own expense while other consumers are furnished lateral mains and connections free for a like and contemporaneous service is, it was held, discriminatory and therefore illegal.

Waiver of Lien by Heating Contractor

The Iowa Supreme Court holds, Van Dyck Heating & Plumbing Co. v. Central Iowa Building Co., 205 N. W. 650, that a provision in a contract for the installation of plumbing and heating in a building that the contractor waived all liens and claims to liens against the building and the land it was erected on to which he might be entitled under the State statutes by reason of work done or to be done and material furnished and to be furnished for the building under the contract, was an express waiver, without ambiguity, which the contractor had the right to make, and was binding on him.

Steam Heating Readiness-to-Serve Charge — Rate of Return — Valuation

A proceeding before the Pennsylvania Public Service Commission to enquire into the reasonableness of proposed new rates for the Overbrook Steam Heat Company concerned chiefly the proposed increase of the readiness-to-serve charge. The company's filed rule for calculating the service unit reads as follows: "Multiply the square of the cube root of the cubic contents by $0.15 (new rate) for detached houses. With pair houses with party walls full length deduct from the above formula 12½% discount. For pair houses with party walls half length deduct from above formula 3½% discount." The condensation rate for steam used was not changed, and remained as it has been since October 1, 1920, at $0.85 per 1000 lbs. of metered condensation.

A cash allowance of $12,500, together with $7,500 for oil and other materials on hand, was found by the commission to be reasonable as working capital. The fair value of the company's property used and useful, including $20,000 for working capital in its steam-heat department, was found to be $370,000.

The commission allowed a 7% rate of return, subject to a deduction for federal income tax, estimated at $1,218. This being approximately 0.33% of the rate base of $370,000, the allowed rate of return was approximately 6.67% upon $370,000.

The commission found that the old rates would not yield the company a fair return, and that increased rates were necessary, but that the proposed new rates, which would yield nearly 12½%, were excessive. However, an increase in the service charge to 10.5 cents was allowed.

Various points in connection with the valuation of the company's property were considered and determined by the commission. In figuring reproduction cost estimates, certain mains used in the company's distribution system and embraced in the inventory were included although they did not appear on the company's books. In the rate base of the steam heating department were included its share of office, shop and garage buildings, of furniture and fixtures, and of automobiles used jointly with other departments owned by the company. The commission took into consideration, in valuing the company's land, its proximity to a railroad siding. The company's claims for interest, taxes and insurance during construction were allowed. A claim for cost of financing was disallowed because the evidence showed no cost as having been incurred in obtaining funds or any need for same. Development cost or "going concern value" was not allowed for, there being no evidence of a lag before the business became established; the commission following York v. Public Service Commission, 85 Pd. Super. Ct. 139, on this point.

Proposed Basement Ventilation Scheme in Oregon Killed

What is described as a million dollar joker in a proposed ordinance in Portland, Ore., was voted down at a recent meeting of the city council. If it had been adopted, it is estimated that the owners of 100 office buildings in the congested area of Portland would have had to expend about $1,500,000 to provide mechanical ventilation in their basements. The clause in the proposed ordinance which aroused the ire of the owners and managers of downtown buildings was as follows:

"Rooms in cellars or basements may be used without natural light for mercantile and manufacturing purposes, providing that ventilation is furnished for each person occupying such cellar or basement room, amounting to not less than 35 cu. ft. of fresh air per minute per person.

"The provisions of this section shall apply to existing buildings, as well as buildings hereafter erected, or altered, within six months after June 1, 1926."

"It would cost the Pittock block $60,000 to install such a ventilation system for our entire basement," said W. M. Oliver, manager of the property. "We just won't do it, that's all. We shall notify our basement tenants to leave if that ordinance goes through. We could not afford to install such a system in the first place and we don't need it in the second."

It will be seen that the proposed ordinance would not only require all new buildings to install ventilating systems in their basements, but would also be retroactive and would make the same requirements necessary in all existing buildings.

Home Owners' Service Institute to Sponsor Demonstration of Model Homes

Under the leadership of the Home Owners' Service Institute, twenty-five or more associations and manufacturers of building materials and equipment will join in a co-operative campaign, which will build, demonstrate, advertise and give other publicity to model homes in 30 cities.

Apparently the gas industry has gotten away to a running start, through an arrangement made by the American Gas Association, whereby gas companies in the cities to have demonstration homes will provide the necessary gas heating appliances for the home. A comprehensive national advertising campaign, involving at least $100,000, has been prepared.

The plan contemplates that the realtor who builds the model home will be bonded to construct nine other houses on his own responsibility, following the plans of the original house as far as may be possible. It thus develops that at least 360 model homes will be constructed in over 30 cities, all of which will be heated with gas.

This announcement, coupled with the statement that gas companies in over 70 cities have recently announced special rates for gas heating, indicates that the gas industry is concerted in its attack upon the domestic heating problem.

International Standards Association Organized

Following an extended series of conferences held in the Engineering Societies' Building, New York, representatives of national standardization organizations from eighteen countries have formally organized the International Standards Association, the objects of which are:

"To lay the groundwork for international agreement upon standards by providing simple systematic means of interchanging information on the standardization work and activities in the different countries.

"To develop general guiding principles for the assistance of the national standardizing bodies.

"To promote uniformity among the standards of the various national bodies.

"It is the intention of the International Standards Association that its work shall include the approval of international standards and the administrative machinery herein set up is so designed that it may be readily extended or modified to include the approval of such international standards when sufficient experience has been acquired."

Delegates, representing practically all of the important industrial nations of the world, sitting in a conference which was presided over by C. E. Skinner, chairman of the American Engineering Standards Committee, discussed the various phases of this ambitious undertaking and before the conference adjourned, formulated a proposed constitution under which such an organization might function.

The chief executive body is to be the "Plenary Assembly," composed of delegates of all the national bodies, with final authority resting with the latter.

The conference recommended that the seat of the organization should be in London, final decision to be made by the first Plenary Assembly. Work on technical questions will be in the hands of technical committees, with a single representation from each country interested.

The conference appointed a committee of seven to formally submit the proposed constitution to the twenty national standardizing bodies and to arrange for a plenary conference for final ratification and organization. The countries represented on the committee are: Belgium, Czecho-Slovakia, Germany, Great Britain, Sweden, Switzerland, and the United States.

America's Manufacturing Efficiency

The unparalleled increase in the manufacturing efficiency of American industry since pre-war days, easily the most phenomenal economic development since England's "industrial revolution" in the 18th century, has set a pace with which Europe and the rest of the world find it hard to compete.

The volume of production in 1923, according to an analysis of industrial productivity in the United States made by the National Industrial Conference Board, 247 Park Ave., New York, was 33% greater per wage earner than it had been in 1914, and required 25% less labor, 13% less power and 17% less management personnel per unit of production, and 7% less actual working time per man.

This achievement of American industry has attracted world-wide attention and has created a situation in which the traditional American problem of meeting the competition of European "pauper labor" is being overshadowed by Europe's curiosity as to the secret of American industry's ability to pay wages that are the envy of the workmen of all other countries.

The explanation of our increased industrial productivity, according to the Conference Board's study, is largely to be found in the greater application of power, more intensive mechanization and increased managerial efficiency.

The Future of the Domestic Oil Supply

By R. L. Welch

General Counsel, American Petroleum Institute.

(From an address before the American Oil Burner Association, Detroit, April 6, 1926.)

THE question, "What petroleum resources will be available in the future for house-heating?" can be answered only by an opinion founded in part on known facts, and in part on conjecture.

The only worth-while opinion about the future is one upon which a man would himself act. Were I to buy a home in any place where furnace-oil is customarily delivered by oil companies, I would carefully avoid poor oil burners and would install the best oil burner sold in the neighborhood by a reliable company guaranteeing service. But I would have certain qualifications in mind. I would hope, but not expect, that furnace-oil would be sold forever for a price which, from a strictly B.T.U. basis, would be on an equality with coal.

The relative prices of soft and hard coal furnish some criterion. Soft coal in most sections of the country is the cheapest source of domestic heat, and therefore most commonly used. Yet in those sections, hundreds of thousands of consumers pay twice or three times as much on a B.T.U. basis for hard coal. Its superiority justifies the price.

Furnace-oil is a superior fuel to anthracite. It is also potential gasoline. The extent of its use for house-heating and for gasoline-making purposes, and thus its relative value, will be determined by the consumer.

QUESTIONS FOR THE FUTURE

Nobody can guess a future that is in the hands of the inventors, the scientists, the technicians. To-morrow is on the lap of the gods. When to-morrow shall have come, what will the organic chemist have done with coal and lignite? What will the engineer and the scientist have done with shale? What will the automotive engineer have done with the automobile engine? What is the manufacturer of oil-burning apparatus going to do eventually about the cost and efficiency of his equipment? What is the oil producer going to do about oil? Finally, what is the public going to do about all these things? The man wise enough to know all this and many more equally baffling things can tell what the exact future of domestic oil burning and supply will be.

THE EVOLUTION OF LIGHTING

Whales furnished sperm oil for light. As the lights multiplied, it was feared the whales would disappear. Then kerosene brightened the world. The whales thought themselves safe in the sea. The worry was transferred to kerosene. What would we do when the kerosene lights went out? The answer proved to be that gas would blow them out before they went out. Next, electricity was about to take both kerosene and gas to the execution chair. And yet to-day the whales are being caught; kerosene rides the seven seas to all countries; gas is everywhere, and electricity rivals the northern lights.

THE PARALLEL OF THE AUTOMOTIVE INDUSTRY

The automotive industry, by all nineteenth century reasoning, ought to have gone bump long ago. Look back to the advent of the automobile; figure the national income of that date; and then imagine yourself trying to prove that by 1926 twenty million automobiles would be operating on the highways of America! You might possibly have satisfied yourself that the national income could support two or three million. But then you would have quit in disgust, exclaiming: "Well, we can't possibly get enough gasoline, so I will revise my figures downward."

The point is that the race has never attempted to solve these problems of the long future every time it has made something, or every time it has bought something. The modern housewife considers herself lucky if the style of the dress or the hat she bought is not changed by the time she gets home with it. Did you ever hear anyone complain in the early days of the automobile because he got a two-lunged Cadillac and then threw it away? No, he got his money's worth for it. People have thrown away their stoves and put in furnaces. They did not feel aggrieved; they felt relieved. People buy automobiles, and the paint gets injured or a new model comes out. They trade them in and buy others.

Are these examples of profligacy? Rather they are the proof of prosperity. Is the race headed for the poor house? We all know it means that we constantly live with more comfort and satisfaction than ever before.

OIL BURNING FOR THE PROSPEROUS MODERN AGE

The oil burner is for this restless, ambitious, and prosperous modern man. It is for the man abreast of, and in harmony with the spirit of the times. It is for him who desires comfort first, and is willing to pay for it. It is for the man who buys a good car, iceless refrigerator; who throws away the broom for the vacuum cleaner; it is for the man who has a good-sized house, comfortable income, and whose primary thought is what he really gets for his money. In my judgment, that man will be satisfied with a good oil burner, properly serviced, if before he buys it he is clearly informed as to the present economic tendencies bearing on his purchase. And these relate in part to fuel supply.

The householder has already determined that question when he bought a six-cylinder automobile. He may not know it, but he has determined it. He prefers to pay 10 to 20 cents per mile, of which only 10% to 15% is fuel cost, for travel without ashes, rather than pay far less for transportation with ashes. The cost of running his furnace and of running his car will not be the same, but the underlying considerations affecting the fuel supply are the same. The oil-burning furnace is six-cylinder heat.

RELATION OF FURNACE-OIL TO GASOLINE

Under present circumstances, the furnace-oil for heat in the basement costs less per gallon than gasoline for heat in the car. But the material used in the basement is potential gasoline. The furnace-oil contains residues that are not useful in an automotive engine. But by cracking, the refiner can put the gasoline in one tank and the residues in another. Because the relative demand for furnace-oil is not now so great as for gasoline, and as furnace-oil does not require as great refining expense as gasoline, and is delivered in comparatively large quantities, it now costs less than gasoline. This will probably continue for an indefinite period, but in the future it is probable there will be a closer relationship between the two than there has been in the past.

The depth to which the refiner will cut into the barrel of crude for motor fuel, for furnace oil, and for all other products, will be determined by the consumer's demand. The consumer finally will decide the relative value of the various ashless fuels.

We come, therefore, to the final problem of whether the probable supply of ashless fuels will be so small as to discourage consumption. And here again we come back to the automotive engine. Putting the problem in practical form, it amounts to this:

A householder who has made up his mind that six-cylinder heat in his home means as much to him as six-cylinder transportation ought to be as alarmed about the supply of furnace-oil for his oil burner as he is alarmed about the supply of gasoline for his automobile.

OIL PRICES BOUND TO FLUCTUATE

The consumer of petroleum and its products, whether for house heating or

for automotive operation, must expect fluctuations in price, as he expects them in other commodities. In looking at the whole situation he can gain comfort from the fact that during the last three years gasoline prices were at about the 1913 level, whereas anthracite prices were double what they were in 1913.

CONSUMER DEMAND TO BE THE DETERMINING FACTOR

Of course, if the conditions surrounding the production and consumption of liquid fuels are to be effected by changes in laws, the thing most apparent is that no changes will be made unless they are such as meet with the consumer's approval. The consumer will determine your destiny and ours and the laws, whether economic or legislative, under which you and we shall operate. As near as one can forecast the future, it would seem that the comfort and convenience of oil burning in homes will stay with us in some form as long as people are willing to pay for, and use extensively high-powered automobiles.

Should Oil-Burner Salesmen Work on Salary or Commission Basis?

A well-known and eminently successful oil-burner sales executive, in a letter to the editor, has expressed ideas contrary to those set forth in the article, "Does Loose Sales Talk Pay?" in THE HEATING AND VENTILATING MAGAZINE for April.

We are particularly glad to print this letter because it comes from a man whose opinions are worth listening to, and the fact that they are at variance with the opinions of an editor of the magazine is neither here nor there. The extent to which THE HEATING AND VENTILATING MAGAZINE can be utilized to express the well-founded opinions of its readers, is a measure of the success of one phase of its editorial work. The letter follows:

"Gentlemen: Please accept my congratulations on your article in the April issue of THE HEATING AND VENTILATING MAGAZINE entitled 'Does Loose Sales Talk Pay?'

"This should be of considerable help to the oil-burner industry as a whole. I believe that many of the misstatements made in various issues of printed matter are simply the result of ignorance and over-enthusiasm and not deliberate falsehoods. Therefore, such an article as yours will do much to point out the necessity of education among those engaged in marketing oil-burning equipment.

"The only point on which I cannot agree with you is the statement that oil-burner salesmen should be paid salaries. As a matter of fact, I personally spent a good many years as an oil-burner sales engineer, working on a straight commission basis and would not accept a position on any other basis. As sales manager of ——— I would not employ any salesman who was willing to go to work on anything but a straight commission basis.

"Of course, this company simply acts as distributors, all of our sales being made through local dealers, but we have eleven territorial supervisors who secure new dealers for us, help these dealers make sales; in other words, put them on their feet. Everyone of these men work on a straight commission basis, with no drawing account or allowance for expenses. There is not one of them who would consider working on a salary basis. Last year, we paid them in commissions all the way from $6500 to $12,000. They are not paid their commissions until we ourselves are paid for the equipment sold.

"I can honestly say that during the four years we have handled the ——— burner, there has not been one case where anyone has made the claim that one of our salesmen has misrepresented our products or service. This is especially remarkable, as I know of many cases where dishonest customers have claimed that salesmen on a salary made certain statements, which I know definitely the salesman did not make. In short, I am convinced by my ten years' experience as a sales manager, that a successful sales organization cannot be developed for the sale of oil burners, ice machines, gasoline pumps or any similar article except by appointing salesmen on a straight commission basis.

"I would say that the answer is not in the method of reimbursing salesmen, but in the method used in investigating salesmen before they are employed and keeping them on the straight and narrow path after they are employed."

Welding an Exhaust Steam Line

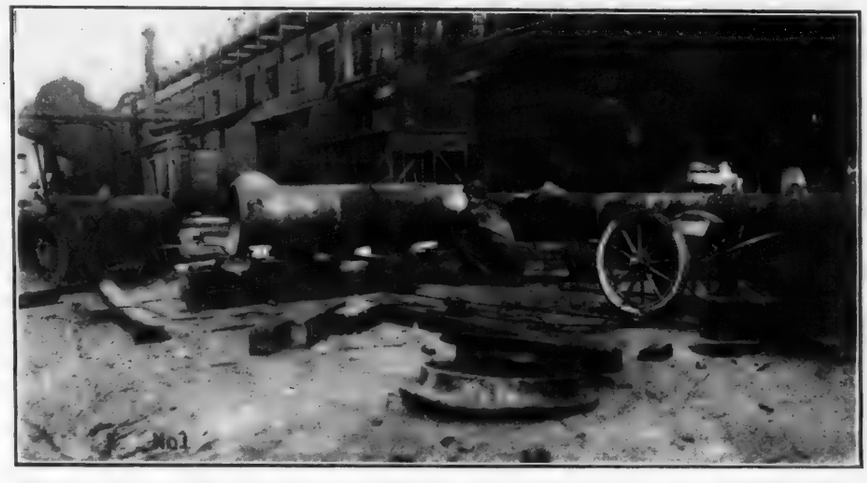


Fig. 1. Welding Equipment and Operator at Work

AN exhaust steam line, consisting of 800 ft. of 30-in., and 400 ft. of 28-in and 24-in. pipe, in which the circular joints, saddles and angle flanges were electric arc welded, has recently been put into service at one of the large steel mills. At first, there seemed to be some doubt among the engineers as to the advisability of arc-welding this line, but an inspection of the finished job indicated that for this class of work, welding is not only prac-

Fig. 2. 100-Ft. Pipe Section Being Hoisted into Place by Crane After Being Welded

ticable, but is to be preferred to riveting.

The pipe for this line was furnished by the National Tube Company and was made from 5/16-in. mild steel, hammer welded.

Fig. 1 shows the equipment and the operator at work. Free flowing low-carbon steel electrodes 5/32 in. in diameter was used in welding the circular

Fig. 3. Close View of Welded Joint and Angle Flange

joints and saddles, and 3/16-in. mild steel in welding the angle-flanges. About 625 lbs. of metal was deposited and the work was completed in 250 working hours, giving an average deposit of 2½ lbs. of metal per hour. Through the use of a portable type of welding machine, known as the Lite Weld Dynamotor type, it was possible to move the welder easily from place to place.

Fig. 2 shows a 100-ft. section being hoisted into place by the crane. As a matter of curiosity to ascertain whether the welds would withstand the strains, this particular section was first lifted by attaching the spreader immediately back of the end circular joint. This induced a tension stress of about 5500 lbs. per square inch in the topmost fibres of the weld without any signs of failure.

Fig. 3 is a close view of a welded joint and an angle flange. It will be noted that the flange extends about ½ in. beyond the end of the pipe which was inside beveled 45° to facilitate welding.

A view of the section of the completed line, showing the method of suspension is shown in Fig. 4. Note the 28-in. manhole of which there were seven, together with numerous other take-offs, ranging in size from a 5-in. tee connection to a 28-in. branch-off at 30°.

Figuring The Coal Waste in The Home From Exposed Heating Pipes

Few heating contractors who install home heating systems and still fewer householders understand how to figure the heat losses from bare pipes in the cellar. As a result, the magnitude of this loss is seldom realized by the man who must pay the coal bill.

It is very easy, however, to measure the pipes and calculate the loss from this source, once the method is understood. Anyone who can add, multiply and divide can do it.

To illustrate the method, let us take a house with, say, 65 ft. of 2-in. pipe and 80 ft. of 2½-in. pipe exposed in the cellar. In measuring the length of pipe, not only the pipes leading out of the boiler, but also those returning to it from the radiators, must be measured and all lateral branches and vertical risers must be included so as to get the total area of exposed pipe.

To get the square feet of surface in the pipe, take each size of pipe separately, multiply its diameter by 3.1416, then multiply this by the length of the pipe in feet and divide by 12. This gives the square feet of surface in each size of pipe and, by adding these together, we get the total exposed area in square feet.

In the case we have taken, we find that the area of the 65 ft. of 2-in. pipe is 34 sq. ft. and the area of the 80 ft. of 2½-in. pipe is 52 sq. ft., making a total of 86 sq. ft.

Approximately 2¼ B.T.U. are lost in one hour from a square foot of pipe for each degree of temperature difference between the pipe and the surrounding air. The exact amount of the heat loss varies slightly with the size of the pipe and the temperature, being much greater than this for greater differences of temperatures, but the figure given above is a fair value for the temperatures found in home heating systems.

It follows from this that if the pipe in the heating system is 90° hotter than the cellar air it will lose 90 times 2¼ B.T.U., or 202.5 B.T.U. per square foot per hour.

If the area of the exposed pipe is 86 sq. ft., the loss will be 86 times 202.5 B.T.U., or 17,415 B.T.U. per hour, and between 7 a.m. and 10 p.m., an interval of 15 hours, the loss will be 15 times 17,415 B.T.U., or 261,225 B.T.U.

Coal, we will say, contains about 14,000 B.T.U. per pound, but nearly half the heat in the coal is wasted in burning it in the ordinary home-heating furnace, so that a pound of coal does not give up more than about 7,000 B.T.U. to the water in the heating system and it will require 37 extra pounds of coal a day to make up the loss of 261,225 B.T.U. from the exposed pipes.

This figures out at 1110 lbs. of coal, or approximately half a ton, wasted each month.

The loss for any particular case may be more or less than the figures here given, depending on the size of the house and the size and length of pipe exposed in the cellar, the climate and kind of heating system, whether hot water or steam, but, by following the method as explained, the owner of the house or the architect or heating engineer can readily figure the loss.

Usually it will be found that the loss is sufficient to justify covering the pipes with insulating material.

One kind of covering may look very much like another, but tests have revealed that there are great differences in their heat-saving qualities. Magnesia derives its value as a heat insulator from the fact that there are millions of microscopic cells in each particle of magnesia. These cells act as dead-air spaces. In choosing the covering for the home heating pipes, therefore, a featherweight magnesia has advantages over a denser covering composed of coarser materials which cannot have the myriad of air cells that are found in the lighter coverings.

Because of this cellular structure, magnesia lacks tensile strength and must be combined with a reinforcing material to produce a pipe covering that will wear. Asbestos fibers, being unaffected by heat, are well adapted for this purpose and, in the best coverings, are combined with the magnesia in the proportion of 85% magnesia and 15% asbestos.

Fig. 4. Section of Completed Line Showing One of Seven 28-in. Manholes in Line.

ENGINEERING FACTS FOR FUEL BUYERS appears on the title page of Anthracite Coal Service, published by the Anthracite Coal Operators, to give free engineering service to those seeking information on the economical use of anthracite coal for heat and power purposes. This is an 8-page bulletin, frankly engaged in combating the use of oil fuel through the publication of derogatory statements regarding oil, rather than by living up to its slogan of giving engineering advice on the economical use of anthracite coal.

British Experiments with All-Electric Houses

FOUR experimental all-electric houses, which the Borough Council of Woolwich, England, decided to erect on its housing estate at Eltham as an experiment, were completed in November, 1924. These houses were entirely equipped throughout with electrical apparatus for heating, cooking, lighting, and hot water supply, and no other means whatever for effecting these services were provided.

Following the completion of over a year's continuous occupation, data relating to the electricity consumption and cost of running these houses during 1925 has recently been published.

While studying these figures, which will be dealt with below, and comparing them with other data it is essential that the size and character of the houses should be kept in mind. The houses are semi-detached and comprise six medium-sized rooms—dining room, parlor, combined kitchen and scullery, and three bedrooms—with separate bathroom, offices, etc. The electrical equipment in each house includes nine lighting points, electric heating plugs in the two living rooms and all bedrooms, a complete electric range, one large 3-kw. and one small 600-watt bowl type, fire, electric wash boiler, and electric water heating apparatus for baths and all other domestic services. So far as the tenants are concerned, the whole of the electrical apparatus and installation is installed free, being largely paid for out of economies effected in the construction of the houses on all-electric lines—that is to say, savings in building costs effected by eliminating chimney breasts and overmantels. The houses are let at rentals of $4.00 per week, inclusive of rates.

OPERATING COST FIGURES

Information relative to the operation of these houses, viz., the number in family, electrical consumption from January 1 to December 31, 1925, and the respective costs are: (a) Five in family, 6,500 units used, cost $135.40 ($2.60 per week); (b) three in family, 6,650 units used, cost $138.54 ($2.66 per week); (c) seven in family, 4,650 units used, cost $96.87 (87 cents a week); and (d) three in family, 5,700 units used, cost $118.75 ($2.29 a week). The basic charge for electricity for all purposes in these houses is one penny (two cents) per unit.

These tests seem to show that the proper way to look at cost figures for domestic applications of electricity is:—Are they reasonable for the quality of the services rendered? In the above case the convenience of electric light, a warm house, good cooking, hot water available day and night all the year round, the elimination of much labor, and greater general comfort for an expenditure of from 87 cents to $2.66 per week certainly justifies an affirmative answer.

An interesting fact concerning the operating figures mentioned is that the lowest consumption is associated with the largest family. A little consideration, however, will show that the number of persons comprising the family is of less consequence in regard to electrical consumption in an all-electric house than the habits of the individuals. Heating accounts for the bulk of the energy used, and next to this comes the hot water service. The man who retires to rest early and the careful family man who switches off his radiators, lamps, and other current-consuming apparatus at all times when they are not actually required have a material advantage in energy consumption.

Canadian Heating Men Act on Free Engineering.

A feature of the recent meeting of the Ontario Society of Domestic Sanitary and Heating Engineers, in Hamilton, Ont., was the report of the society's heating committee, P. C. Mansell, chairman, which took a definite stand on free engineering and other practices which are not looked on with favor. On these subjects the report states:

We wish that heating supply men would not draw plans, compute radiation quantities, estimate costs and otherwise educate the operator who did not educate himself when the opportunity presented itself.

We wish that the supply men would not finance the operator who cannot limit his operations to his own finances.

We wish that the industrial plants and factories throughout the province would listen to logic by discharging the handy man from their employ and engage, when the occasion demands, a master steamfitter to attend to their needs in a legitimate manner and at less cost.

We wish that the supply men would cease their methods of catering to these industrial plants and factories by refusing to sell them, except at protective prices.

Then every day would be Sunday.

How many of you in attendance have strained every point of your respective organizations to render acute assistance to an industrial plant when it has been attacked by some critical problem, or by a serious breakdown that was too complicated for its own maintenance department.

And what thanks was given you?

Was your bill passed through as rendered, or were you not confronted with a discount sheet showing lower costs than your own?

If you had refused to render assistance, would your standing and your profits have been lowered?

If one supply man insists on making plans and estimates because the other fellow does it, would it not be practicable to ask for plans and estimates on everything that comes to your notice and either sicken him of this practice, or force him to build additions to his offices to accommodate an engineering staff that would be as efficient as the other fellows?

We must co-operate in order to stamp out the ever increasing evils that I have mentioned.

We should make our own plans and our own estimates.

We should receive a line of credit only when that credit is due us.

We should purchase materials at lower costs than those who do not make this trade their livelihood, and these materials should only be installed by a master steamfitter or his employee.

Our calling is degenerating.

A few more years of growth and the practices now in operation will have forced us to become merely installers of heating goods, without the necessity of maintaining a business telephone.

Conditions are similar all over the province.

The antidote, however, can be more easily injected in one district than in another, and it is my belief that the co-operation of two, three or more operators in any given section will improve conditions in that community and will be done quietly and beneficially without the resultant noise of a provincial-wide broadcast that would be too unwieldy to function.

Liberty's Home Building Service

Based on a recent article entitled "And So We Built a House," published in its issue for February 13, 1926, *Liberty* has inaugurated a home-building movement in the form of a number of 4-page articles dealing with home building. Four residences have been selected, which are now in the course of construction, ranging in value from $7000 to $20,000. The articles will detail the building of each home, showing the progress of construction. The text will be supplemented with photographs. The series begins with the June 12 issue, and each week thereafter progress will be reported on one house each week. At the same time, *Liberty* will inaugurate its Home Owners' Department, designed to answer letters of inquiry as to matters of construction and similar questions. After the houses are built, *Liberty* will follow their furnishings and fittings to acquaint its readers with the steps actually taken in each house to complete its equipment.

Typical Radio Talks on Heating

IT is likely that many men in the heating industry will be called upon from time to time to give radio talks on heating and ventilating subjects. For their benefit, as well as for the information contained in the talks themselves, we presented last month the first of two recent addresses, broadcast through Station WGES of Chicago, in connection with the Chicago "Own Your Home" show. That talk, on "Certified Heating," was delivered by Harry M. Hart, chairman of the board of directors of the Heating and Piping Contractors National Association. Below, we present the second talk given from the same station by Samuel R. Lewis, a well-known consulting engineer of Chicago, and former president of the American Society of Heating and Ventilating Engineers.

Insulation

By Samuel R. Lewis

(*From a talk broadcasted March* 31, 1926, *through Station WGES, Chicago*)

WITH the passage of time, a very definite fundamental technique has been evolved in building various types of houses.

The *Earth* house of primitive times had solid walls, and when the earth walls were rammed hard enough and were kept perfectly dry, and when there was a good thick thatched roof and when the surface drainage was perfect, such a house was, and still is, hard to beat.

The *Frame* house had frequent vertical wooden posts or studs, covered on the outside with boards, and on the inside with plaster, leaving tall, narrow air spaces between the studs and the two facings. These air spaces were at first in quite free communication with the outside, through the cracks in the boards, even though the outside boards were lapped over each other so as to shed water. The inside plaster (or whatever other material might be used to face up the studs) was porous, and there was always a considerable movement of air across the walls, for these reasons.

If the house was heated, the air next to the plaster, in the space between the studs, would get warm, too, and would rise. If it was chilly outside, the air in the space between the studs next to the outside facing would get chilly, too, and would fall. Thus each stud space has always a little local air circuit, up on the warm side, picking up heat from the warm wall, and down on the cold side, giving off the heat to the cold wall.

The *Masonry* house, of brick or stone, had solid walls. Sometimes these solid walls were plastered on the inside, directly on the masonry. Sometimes vertical wooden strips about 2-in. wide were fastened to the masonry, and the laths and plaster were applied to these strips, so as to straighten up the rough masonry, saving some plaster, and forming an air space. Such a false facing on a masonry wall is called "furring." The vertical wood pieces are called "furring strips."

The frame houses and the masonry houses have come down to us from antiquity, all fundamentally according to this construction.

No changes in the fundamental construction of houses have occurred for centuries. The casual appearance of the walls of a house, either interior or exterior, may be beautified to a fabulous extent, with costly imported woods and marbles, but the basic structure of the walls is always the same and comes under one of the traditional classes of earth, stone or masonry.

HOW HEATING REQUIREMENTS VARY WITH DIFFERENT TYPES OF HOUSES

The frame house, we find, on the rare occasions when anyone has considered it at all, is easier to heat in winter, and easier to keep cool in summer, than the masonry house.

The masonry house which had its plaster directly on the walls has acquired a reputation for dampness and mould.

The masonry house, with the plaster furred out from the walls, and the frame house, have acquired a bad reputation as fire risks. Every time one of them catches fire there is no salvage. It seems to be on fire all over at once. Even if the fire starts in the basement, it appears at the roof in an incredibly short time.

The empty spaces between the vertical studs and the facings, and the spaces between the furring strips, the plaster and the masonry, are convicted of becoming fire flues, carrying the flame like chimneys, getting a draft of air from below, delivering the smoke to the attic above, and burning their hearts out before giving evidence in the rooms or on the outside.

Any proper modern house then, has these flues stopped at every story with air-tight horizontal diaphragms, so that no through-going flue can exist.

The houses with the tight air spaces due to the fire stops are discovered to be taking less fuel and, are cooler in hot weather, and incidentally, especially if the stops are of plaster or metal, do not have rats or mice!

The houses with the fire stops at intermediate points between story levels and the consequent smaller air chambers are doing even better. This of course is due to the lowered ability of the interior air circuit to carry heat over to the cool side.

So great is the economic pressure, however, for more buildings, and so ignorant are the owners and so weak-kneed are the architects and the contractors that even to-day we are building great buildings, wonderfully ornamented, with solid brick or stone walls, without any furring or air spaces.

We even have laws which, until recently, prohibited the use of hollow tile and which still restrict it; though an indifferently-laid poorly-cemented hollow-tile wall is proved to be capable of holding one-fifth more heat than a solid brick wall of equal overall thickness.

All of our skyscrapers which carry their walls on the skeleton at each story, use thin brick work, in most cases not furred, and have only 4 in. of the wall carried through from basement to roof. As the skeleton expands and contracts this 4-in. wall has cracks, which open and close freely, and which admit gales of air and dust and soot. The occupants of these buildings wonder why the radiators are so big, and the owners worry about the cost of heating.

ARCHITECTS AND BUILDERS KNOW HOW TO INSULATE HOUSES

The sad thing about it all is that the architects and the builders know how to insulate houses, and have known how to do so for years. The common people, who must live in these houses, who, in the final analysis, must pay for them, have been indifferent.

It is entirely practicable, structurally, to reduce the amount of heat required by any ordinary building by one half, without materially increasing the cost of the building. All that is needed to do this is a very little courage and a very little common sense.

For instance, a building in my own experience was to have a certain kind of very ornamental roof having a well-known high rate of heat transmission. Under protest, I designed a heating plant to overcome this loss. My protest finally registered with the owner. We found that by using another type of roof, costing $600.00 more, we could reduce the cost of the heating plant $1800.00 and would save over $400.00 per year in fuel forever after!

I was called by my own family doctor, a prosperous and thrifty soul at that, to examine an old house which he proposed buying as a residence and as an investment. I found that this house had furred walls, with furring spaces

open from leaky basement to leaky attic. It had a reputation, I learned, of being hard to heat. Furnace after furnace had been burned out in the attempt. I hate to think of the tonnage of coal that must have been burned trying to heat that old house. I told the Doctor if he bought that house he'd have to cut channels through the furring all the way around the outside walls on every story, and put in fire stops before the house would be habitable or safe. To do this, and to redecorate, would cost nearly as much as the old house and its lot would cost!

Houses have been built repeatedly, in Chicago, to my personal knowledge, some of them to my design, using standard commercial materials such as are in the market every day, which use half or less than half the fuel used in adjacent ordinary houses of equal size, and in which the reduced cost of the heating plant paid for the added insulation in the walls and for the air leakage prevention around the windows and floors.

There is a classical example in Chicago of an insulated house in which the owner applied part of the ordinary appropriation for heating apparatus to a thorough insulation of the walls, floors and roof. He spent five hundred dollars more for the building and five hundred dollars less for the heating. As a consequence he is able to heat his house with hot water, burning gas automatically controlled, and almost perfect as mundane things go, at a fuel cost no greater than he would have had to incur for coal. This is taking no credit for the coal and ash handling and curtain washing and house cleaning which he and his good wife would have had to do if they burned coal.

A great part in insulation is the exclusion of moisture and the prevention, in the insulated spaces, of air currents of any moment.

Tests have proved that a thin steel plate backed up with as little as an inch of good vegetable insulating material is capable of retaining more heat than 13 in. of brick work. More than twenty times as much heat will pass through an inch of brick than through an inch of this insulation. The steel is air-tight and moisture-tight, and allows the cellular insulation to develop its full value unhampered by air currents and moisture.

Experience with refrigerating plants goes to show that the cork insulation used against outside brick walls and protected with Portland cement plaster inside, suffers greatly from the inroads of moisture, and the best up-to-date practice includes a thorough water proofing of the surface against the cork. The moisture not only breaks down the physical structure of the insulation, but also reduces or nullifies its insulating value.

To exclude moisture from our houses, by all means, we should insist that all masonry walls be waterproofed with a bituminous-like backing, preferably applied hot. Plaster isn't good enough. Plaster is only a fine sieve which passes air freely. Provision must be made also with masonry walls, to prevent moisture traveling upward in the walls themselves, by capillary attraction. All good walls have waterproofing courses near the ground level, or are waterproofed throughout their surfaces, from footings up. This provision is often carelessly omitted, and the house is then a damp house, and walls will not stay painted, and bricks crumble. Who has not seen brick and stone walls, as in fences, where waterproofing was omitted, disintegrating rapidly, due to frost action on the water which was carried up in the interior of the walls by capillary force?

Wood expands when wet and contracts when dry. No wood known will remain tight under the drying and wetting and drying again of outside weather conditions. We stopped trying to find any such wood long ago, and now use shingles and overlapping siding, which sheds moisture. Unfortunately such construction has almost unlimited air passages, open to wind.

Therefore to exclude moisture from our wooden houses we must use a heavy waterproof, air-tight skin under the siding, preferably applied with hot bituminous compound at all joints. The more small, confined air spaces there are in the walls after you have taken care of moisture and of air infiltration, the warmer will your house be.

The ceilings of any room and the roof of any house are warmer than the floors, because heated air is lighter than cooled air. Have you ever noticed how quickly the snow melts off the roofs of some houses? A proper house should keep its snow as long as the yard or the sidewalks keep theirs! In any proper house there should be a tight attic, preferably divided into many compartments, with an insulated roof and with an insulated floor. Wind, sun, moisture, all work on the roof; the greatest heat losses occur here. Yet, in most houses the roof is the same roof our ancestor used to put on his cow shed.

Wonderful savings have been made in many old houses by placing easily applied insulation over the tops of the top story ceiling joists.

Look out for all tile, slate and shingle roofs! They are a mechanical protection like armor or paving, but are not of any other use without an air-tight and heat-tight structure under them, since they must overlap rather loosely, so that they can expand in the heat and contract in the cold.

Remember that the colder the ceiling of any heated space, the hotter it will have to be in that neighborhood in order to get the floor warm.

With a heated first story, no heat in the second story, no insulation between first and second stories, and thoroughly insulated second story ceiling and walls, it has been found that the temperatures ran 70° on the first story and 50° on the second story during ordinary winter weather. This seems to me to present decidedly interesting evidence of what insulation can accomplish.

Death of Clarence V. Kellogg

A long and busy career in the heating industry was brought to a close when Clarence V. Kellogg, president of the Kellogg-Mackay Co., Chicago, died suddenly at his home in that city, May 8. Mr. Kellogg had suffered a slight heart attack last February, but apparently had recovered his health. He was 66 years old.

Mr. Kellogg entered the heating industry in 1893 as treasurer of the American Boiler Company. In 1898, the Pierce, Butler and Pierce Manufacturing Company took over the eastern business of the American Boiler Company, while the western end of the business was reorganized under the name of the Kellogg-Mackay-Cameron Company. In 1909, Mr. Cameron retired and the concern became the Kellogg-Mackay Company. Mr. Kellogg was long an active and, in many respects, a dominating figure in association affairs. He was president of the Central Supply Association from 1913 to 1916. He was also at one time president of the National Tubular Boiler Co. and of the Illinois and Wisconsin Jobbers' Credit Bureau. He was interested in other concerns connected with the heating industry, being at one time vice-president of the Pierce, Butler & Pierce Manufacturing Corporation and a director of the Kewanee Boiler Company. He had also been president of the American Boiler Manufacturers' Association.

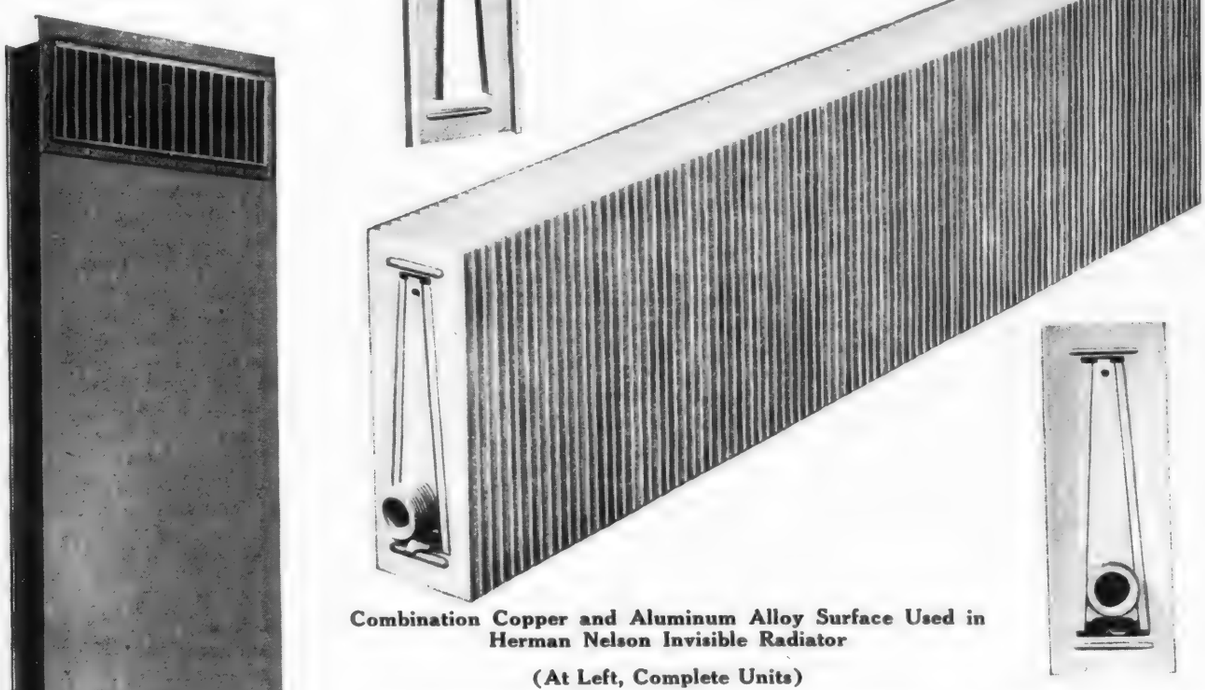
R. Sanford Riley, president of the Riley Stoker Corp., Worcester, Mass., and long recognized as an authority on combustion, died at his home in Worcester, May 7. He was 62 years old. Mr. Riley was a graduate of the Worcester Polytechnic Institute. His most notable work was the development of the Taylor stoker and the invention and development of the Riley stoker. In 1912, he organized the Riley Stoker Corporation.

W. J. Santmyer, superintendent of steam and district heating for the Puget Sound Light and Power Co., Seattle, Wash., died at the Mayo Clinic in that city. He was 64 years old. Mr. Santmyer during recent years had been a familiar figure at conventions of the National District Heating Association, where his breezy discussions on a wide variety of topics were always an interesting and sometimes a hilarious feature of the sessions. Mr. Santmyer's early career was in the machine field. In 1900, he took charge of all steam stations and district heating systems for Stone & Webster in Seattle. He had held his position with the Puget Sound Light and Power Company since 1921.

The Age of the Invisible Radiator

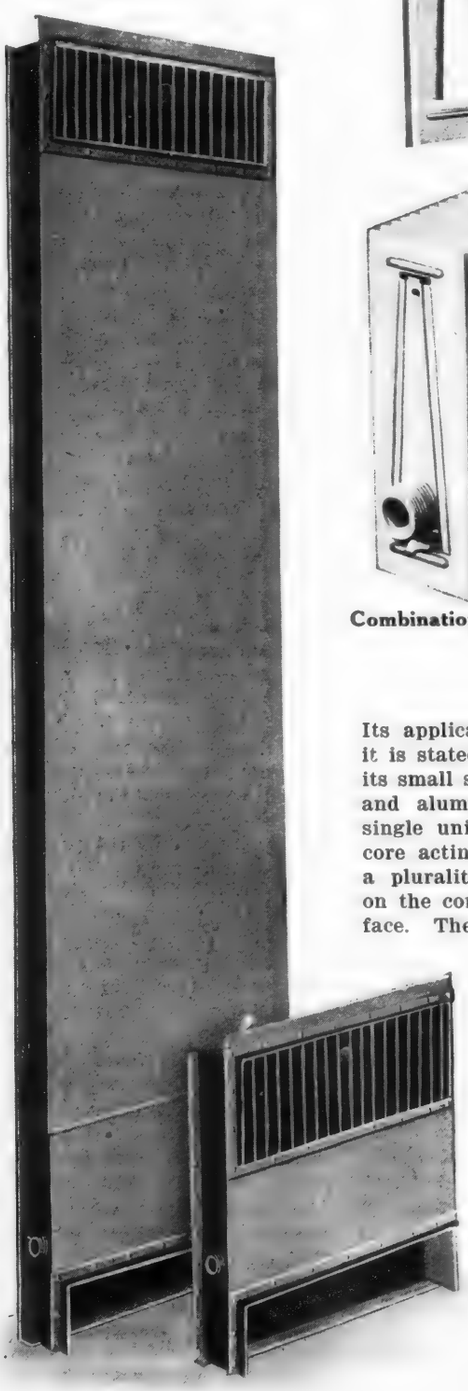
Under the name of the Herman Nelson Invisible radiator for steam, vacuum and vapor heating systems, the Herman Nelson Corporation, Moline, Ill., announces a departure from the accepted form of direct radiation which stamps the product as unique in its field. It is made of copper and a special alloy of aluminum and is described as a powerful heating element that can easily be picked up and carried, as the unit, which is 3¼ in. wide and 9 in. high, weighs but 40 lbs. It has a single steamway and its smooth surfaces and straight passageways offer little resistance to air circulation, at the same time keeping it relatively free from dust.

The radiator is the same kind of unit that is used in the company's Univents.



Combination Copper and Aluminum Alloy Surface Used in Herman Nelson Invisible Radiator

(At Left, Complete Units)



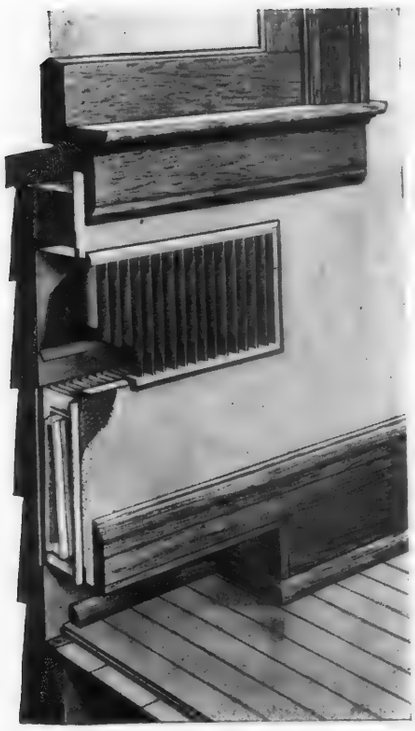
Its application as a separate radiator, it is stated, has been made possible by its small size, due in turn to its copper and aluminum construction. It is a single unit consisting of a cast metal core acting as a steam container, and a plurality of copper plates mounted on the core and acting as heating surface. The radiator is of the extended surface type. It is the means by which the extended copper surfaces are brought in intimate metallic contact with the steam container that is declared by the manufacturer to be the secret of the high efficiency which the heater has shown. The steam container or core of cast aluminum is wedge-shaped and the outer smooth surfaces are smoothly machined. The copper plates are die-stamped, with a flanged opening in the middle which fits closely over the core. The plates are first loosely assembled on the core and then driven down and wedged into position so that there is a close metal-to-metal contact. The unit occupies about one-eighth the space and about one-tenth the weight of a standard cast-iron radiator of equal heating capacity.

The steam container is a unit casting, with no soldered, brazed, welded or expanded joints. The most severe freezing tests, it is stated, have failed to disclose any weakness.

The complete unit comprising the invisible radiator includes a steel cabinet having a cold air inlet opening at the base and a warm-air outlet grille, with damper, at the top. The unit is designed to be placed in a wall or partition, covered with metal lath and plastered so that nothing will show but the opening at the bottom and the outlet grille. The cabinet rests on the rough floor and the finished floor is carried inside so that the bottom may be cleaned whenever the floor is cleaned.

The recess or pocket in the wall to contain the cabinet is wider than the cabinet to allow room for concealed pipe connections. No valves are required since control of the temperature is secured by the damper at the outlet grille. Cut-off valves, if desired, may be placed on the branch lines in the basement.

Two heights are furnished, one styled Type A for use under windows, and the other Type B, where high outlets are desired. They are made also in four



Type A Installation Herman Nelson Invisible Radiator

widths, designated as 20-in., 30-in., 40-in. and 50-in.

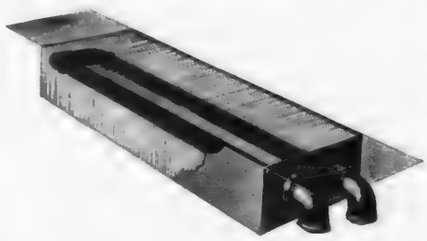
In a catalogue just issued by the company a supplement is included covering mechanical data of the Herman Nelson Invisible radiator. In this supplement data are given on standard applications of each type, with dimensions and capacities, also a heating capacity chart and an equivalent radiation table based upon 38-in. cast-iron direct radiators.

A beautifully-compiled and printed manual has been published by the company dealing at length with the Invisible radiator, with many illustrations in color of various applications in the rooms of a home. Size 8½ x 11 in. Pp. 16. Size of "Mechanical Detail" manual, 6 x 9¼ in. Pp. 24.

The Trane Heat Cabinet

Details of the new heating unit known as the Trane heat cabinet, announced last month by the Trane Co., La Crosse, Wis., bear out the interest aroused by the original announcement. As was stated in that announcement, the heating surface of these new units consists of a U-shaped copper pipe and copper fins. This construction, it is stated, not only provides high heat transmission, but the U shape is especially effective in eliminating air binding.

As described by the company, the Trane heat cabinet heating system is the development of the principle of rapid circulation of air through a new light-weight copper heating element. It is intended to take the place of the

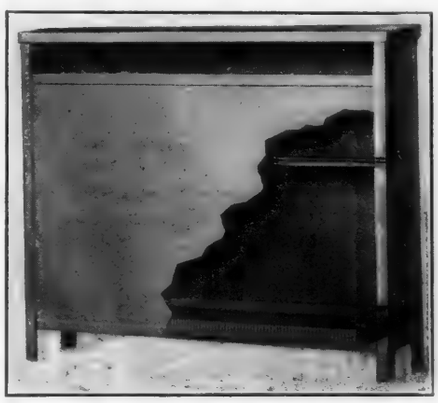


Copper Heating Unit of the Trane Heat Cabinet

ordinary cast-iron direct radiator and is described as adaptable to all modern systems of heating, including steam, vapor, vacuum and water.

Air passes through the cabinet at a velocity of from 100 to 150 ft. per minute. The number of heat cabinets required for the average house weighs about the same as one ordinary radiator, while the cost is given as less than that of a cast-iron direct radiator with a shield. When the heater is installed in a wall, there is, of course, an additional cost to be figured covering a grille, with louvres, and an adjusting damper, as well as the sheet-metal work between the heater and the outlet.

In the matter of space occupied, the cabinets occupy less room than equivalent cast-iron radiation. If desired, they can be built into walls or installed between joists in the basement so that only the heat outlets are visible. Heat control is secured by means of a damper which is furnished with the cabinet. When completely closed, the damper completely shuts off the circulation of air through the cabinet. The outlets just below the top cause the air to flow out into the room, rather than upwards towards the ceiling. The radiation of heat, it is added, is accelerated from 300% to 400% when these heat cabinets are used with present types of heating systems. A 100-sq. ft. unit contains less than one quart of water, which permits quick heating effect in water heating systems.

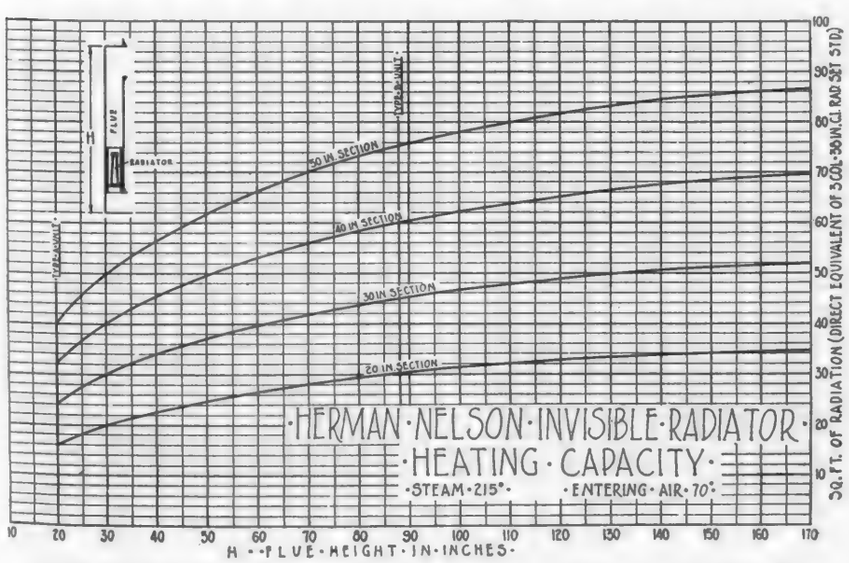


Trane Heat Cabinet Cut Away to Show Heating Element and Damper

One of the features especially emphasized is the ease with which Trane heat cabinets may be installed and moved after installation.

The cabinets are made in four lengths —13 in., 27 in., 41 in. and 56 in.—and three heights—19 in., 26 in. and 38 in., with a range of capacities from 6 to 70 sq. ft. of equivalent direct cast-iron radiation. The width of the cabinets is 7 in. for all capacities, while the heater itself measures 6 in. wide and 3 in. high. The cabinets are rated on the basis of results compared to cast-iron. Tappings are all 1 in. at present.

In addition to the types and sizes announced, the company will put out another series using two heaters in one casing, designed to give 50% more heat from the same cabinet, thus reducing the required floor space. Production, it is stated, will insure deliveries in quantity by September.


H
FLUE
RADIATOR
50 IN SECTION
40 IN SECTION
30 IN SECTION
20 IN SECTION
HERMAN·NELSON·INVISIBLE·RADIATOR·
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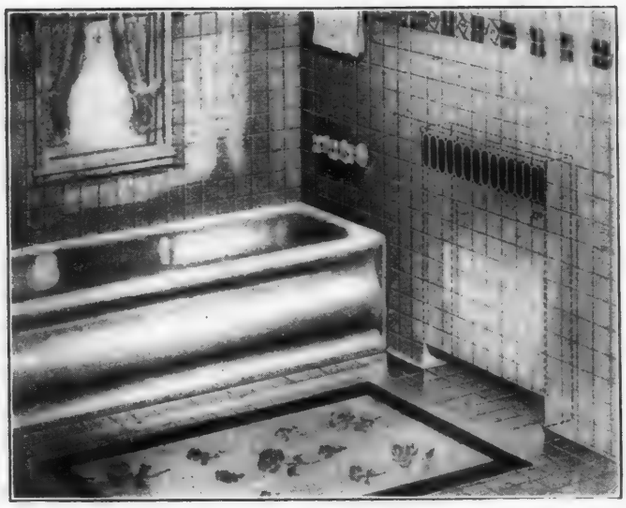
·STEAM·215°· ·ENTERING·AIR·70°·
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170
H··FLUE·HEIGHT·IN·INCHES·
10 20 30 40 50 60 70 80 90 100
SQ. FT. OF RADIATION (DIRECT EQUIVALENT OF 3-COL. 38 IN. C.I. RAD. SET STD.)

Heat Capacity Chart for Types A and B Herman Nelson Invisible Radiator

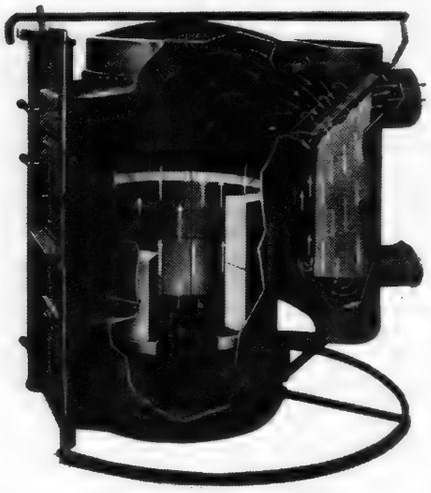


Installation of Trane Heat Cabinet in Bathroom Wall

Arrangement of Trane Heat Cabinets in Drawing-Room

A New Boiler Plate Furnace

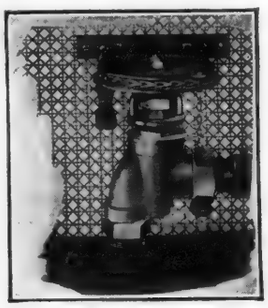
A gas and soot proof furnace made of boiler plate, riveted and welded, designed particularly for use with oil burners, has been brought out by the Colburn Heater Co., 1955-65 North Long Ave., Chicago, Ill. The combustion chamber, containing the grate and fire lining, has thus been made proof against gas and smoke leakage. Large double-doors are provided, admitting any kind of fuel. The pouches on which the doors are hung project through the front frame, in that way insuring a tight air circulating chamber. The crescent radiator used in this heater is made in one piece. An unusually long smoke and gas travel is secured through the three-flue construction. The radiator is attached to the furnace by means of a deep cup joint. Special attention has been given to the design of the grate, which has prongs of extra length for cleaning the rim of the fire pot. A tuyere is fastened to the fire door of the heater to admit preheated oxygen.



Type of Riveted and Welded Warm-Air Furnace Designed for Oil Burning

Lock Chain-Pull Valve for Enclosed and Overhead Radiators

A radiator chain-pull whose action is likened to that of the chain-pull electric light socket, is a timely product announced by the Gorton & Lidgerwood Co., 96 Liberty St., New York. It is known as the Gorton quarter-turn packing lock-chain pull valve. This valve needs to be turned only a quarter of a circle to fully open or close. The same size wheel is mounted on all sizes of valves, and the actual lineal length of movement of the chain in fully opening or closing the valve is 3½ in.



Gorton Chain-Pull Valve

The principal use of this chain-pull valve is on radiators placed behind grilles. The handles, which are outside of the grille, are marked "Open" and "Shut," so there never need be any doubt as to the position of the valve. Another use for this chain-pull valve is to control radiators or other heating units hung from the ceiling or placed high on the wall.

Application of Gorton Chain-Pull Valve to Enclosed Radiator

A New Leak-Tight and Flexible Pipe Joint

A leak-tight and flexible joint for steel and cast-iron pipe and hose, intended for use in compressed air, water, oil

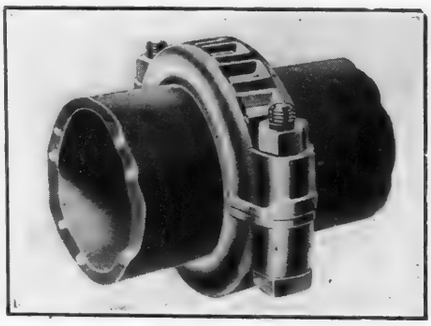


Fig. 1. Assembled Victaulic Joint of Standard Design

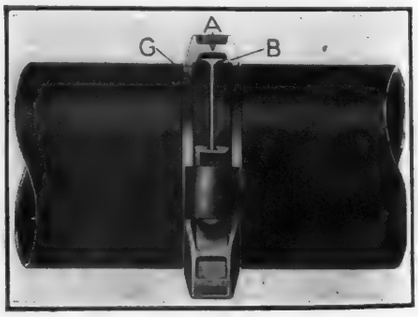


Fig. 2. Cutaway View Showing Details of Construction

and gas lines and for pressures from vacuum to two tons per square inch, has been brought out by the Victaulic Co. of America, 26 Broadway, New York, under the name of the Victaulic pipe joint.

Easily the most interesting characteristic of the Victaulic joint is the fact that it couples the pipes together as positively as a flange, yet is flexible under pressure. Even ground movement and vibration, in addition to expansion or contraction of the pipe, it is stated, do not affect the leak-tightness of Victaulic joints. They are available for nominal pipe sizes from 1 to 12 in. in diameter. In addition to the joints themselves, special fittings of standard dimensions are furnished, such as elbows, tees, adapters and reducers.

Pipe Line Made up with Victaulic Joints Following Uneven Contour of Ground

American Society of Heating and Ventilating Engineers

The 1926-27 Guide.

The Guide Publication Committee, recently appointed by President Driscoll, of which Perry West is chairman, is already at work on the 1926-27 annual edition of the A.S.H.V.E. Guide. Mr. West desires the co-operation of every member of the society in securing information and material for this edition and is particularly anxious to round out the section on ventilation. There is also an increasing demand for more data on oil burning, gas heating, insulation of homes, underground piping systems, mechanical draft, symbols for drawing, fan-blast heating and new laboratory data.

In addition to the chairman, the committee is composed of A. R. Acheson, J. E. Bolling, L. A. Harding, C. V. Haynes, E. V. Hill, S. R. Lewis, W. J. McConnell, C. L. Riley, A. C. Willard and C. P. Yaglou.

Society Issues Membership Cards

In accordance with a plan recently approved by the council, Secretary A. V. Hutchinson is issuing membership cards to members in good standing. Reprints of the constitution, containing the five amendments recently adopted by the society, are also being mailed to members. A membership book is in preparation outlining the functions of the society and its activities.

Pittsburgh Chapter

C. A. Thinn, of the C. A. Dunham Company, was the principal speaker at the April meeting of the Pittsburgh Chapter. His subject was "Low-Pressure Steam Heating Systems."

In connection with the plans of the Pittsburgh Chapter for the establishment of the heating research residence, it was voted that a committee of three be appointed by the president to confer with the council of the society and report back to the Pittsburgh Chapter the extent of the society's participation in this project.

Western New York Chapter Meets in Rochester

Through the courtesy of the Rochester Gas and Electric Company, the members of the Western New York Chapter, at their April meeting, had the opportunity of inspecting the company's Lawn Street plant in Rochester and were later entertained at a performance in the Eastman Theatre as guests of the company. The Lawn Street plant proved of unusual interest as it was constructed primarily for heating a number of large buildings in the downtown section of Rochester. Some of these buildings are located three-quarters of a mile from the plant. The distribution system, outside of the plant, was installed by the American District Steam Company.

Sixty members and guests sat down to dinner in the Roof Garden of the Sagamore Hotel, directly following the theatre performance. The principal speaker of the evening was Samuel E. Dibble, past president of the society. He spoke at length concerning the work accomplished and that undertaken at the society's Research Laboratory.

A number of the members of the Rochester Board of Education were present, as well as members of the special committee appointed to investigate mechanical versus open window ventilation, to be tried out in the Rochester schools. The question of "How to Determine When a Room is Properly Ventilated?" was discussed at length by members of the society, members of the special committee and by a number of prominent physicians in Rochester.

The arrangements for the meeting were made by R. T. Coe and F. J. Weider.

New Officers for Michigan Chapter

New officers of the Michigan Chapter elected at the May meeting, held May 17 at the Meadowbrook Country Club, Detroit, Mich., are as follows: President, J. F. McIntire; vice-president, M. W. Calvert; secretary, William G. Boales; treasurer, H. A. Hamlin. Directors: L. L. Smith, W. M. Foster and G. H. Schildmiller. A golf tournament preceding the meeting proved an attractive feature, bringing out a large attendance, making the meeting one of the most successful ever held in the history of the Michigan Chapter.

New York Chapter Closes Season

A full attendance of New York Chapter members and guests greeted President R. H. Carpenter, who officiated for the first time at the chapter's May meeting, held at the Building Trades' Employers Club, New York, May 17. As this was the closing meeting of the year, the evening was given over to jollity and professional entertainment.

In addition to President Carpenter, the other officers of the chapter, elected at the April meeting, are: Vice-president, R. A. Wolff; treasurer, F. E. W. Beebe; secretary, E. B. Johnson. Board of Governors: A. A. Adler, S. L. Goodwin, and H. B. Hedges.

New Officers of Ontario Chapter

New officers of the Ontario Chapter, elected at the chapter's April meeting, are as follows: President, A. J. Dickey; vice-president, R. W. McHenry; secretary, M. W. Shears; treasurer, H. J. Church. Board of Governors: H. H. Angus, K. S. Leitch, A. R. Flett, M. S. Thomas and C. J. Dowdy.

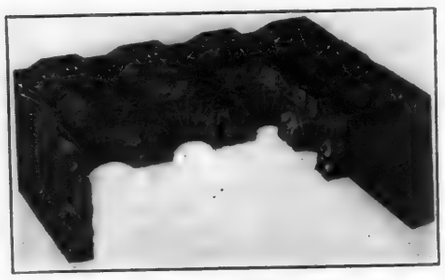
New Books

I'LL NEVER MOVE AGAIN, by Fitzhugh Green, is a stimulating little book dealing with the problems of the renter and the home-owner. The author is an officer in the United States Navy who has been through the ordeal of moving some 52 times. He has also served as a member of housing committees in different cities both in the East and in the West. The book is written in a light vein but contains much in the way of advice to interest the heating contractor, as well as the lawyer, landlord, insurance man, railroader, banker, real estate agent, plumber and home builder. Size 6 x 9 in. Pp. 209. Published by E. P. Dutton & Co., 68 Fifth Avenue, New York. Cloth, $2.00.

New Trade Publications

PYRAMID GRATE is featured in an elaborate and interesting catalog prepared by the Pyramid Iron Products Corp., New York. This catalog describes the construction and functioning of the patented Pyramid grate, which is designed to secure high efficiency in the burning of small sizes of coal.

This grate is so designed as to provide an effective air space approximately 30% of the grate area, yet the air travel in these spaces is horizontal and the finest of coal is prevented from falling through the grate by this design. Pyramid grates are made in dumping, shaking or stationary types for rectangular and circular fire-boxes. There is also described a complete line of forced-draft equipment consisting of Pyramid multivane, low-pressure blowers, with the necessary electrical control. The catalog contains diagrams and drawings of typical layouts and a number of pages contain descriptions of typical installation in and about New York City where material savings have been effected through the use of small-sized coal burned on Pyramid grates. Size 8½ x 11. Pp. 24.



Section of Pyramid Grate Showing Diffusion of Air

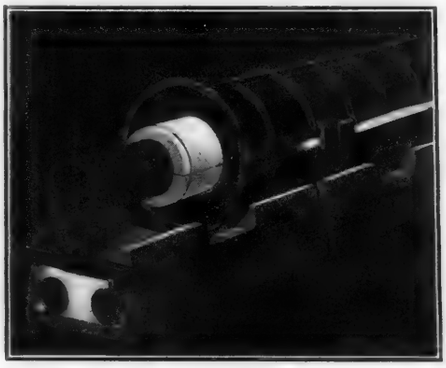
TIMKEN-ARROW OIL BURNER is the title of a circular prepared by the Timken-Detroit Co., Detroit, Mich. The circular describes the Timken-Arrow burner, a twin to the Socony-Arrow burner, which has been marketed in the New England States by the Socony Company of New York. The text in the circular is an exceptionally conservative and accurately-worded description of the burner, with no frills or undue use of adjectives. Of particular interest is a section "Engineering Survey," from which is quoted the following:

"Satisfactory residence heating with oil depends upon proper co-ordination of the oil-burning equipment and the heating plant. For that reason, a qualified heating engineer is stationed at each retail branch of The Timken-Detroit Company. His duty is to make a complete survey of each customer's heating system. If he discovers faults in the system, such as an undersized boiler, deficient radiation or incorrect piping, the owner is notified and requested to correct the deficiences before the burner is installed. In this way any danger of an unsatisfactory installation is avoided."

Under the caption "Undivided Responsibility," the circular calls attention to the fact that in accordance with the recommendation of the National Board of Fire Underwriters, the Timken-Arrow burner is installed only by representatives of the Timken-Detroit Company, following the survey mentioned in the previous paragraph. As the necessary servicing of the burners is also done by the Timken-Detroit Company, the customer is assured that there is no possibility in case of trouble of an evasion through divided responsibility.

RACINE 8-DAY TIME SWITCH for oil-burning equipment is featured in a circular issued by the Federal Gauge Co., 564 W. Adams St., Chicago. The switch is composed of three units, a clock movement, a switch mechanism and a snap switch, all of which are interchangeable. The switch has a light (on) hand and a dark (off) hand traveling in separate planes and performing only their separate duties. Two types are furnished, one of 10 amperes, the other of 20 amperes capacity.

RIC-WIL CAST-IRON CONDUITS FOR EXTRA-HEAVY DUTY, which are now furnished by the Ric-Wil Co., Cleveland, O., are the subject of a recent circular. This construction is designed for use where conduits run under or near railroads and similar places where load and vibration are excessive. In design, it is like the tiled Ric-Wil except that the sections are 4 ft. long with top and bottom sealed with Loc-Lip joint and special sections for pipe support. It is ribbed in casting to give great strength with minimum weight. Four sets of side lugs are used to insure tight seats along the joints and to prevent displacement. The cast-iron conduit is made in eight sizes running from 4 to 20 in.



Ric-wiL Cast-Iron Conduit for Extra-Heavy Duty

PIERCE JUNIOR BOILER is described in a small folder received from Pierce, Butler & Pierce Mfg. Corp., New York. The circular describes a small boiler for steam or water heating designed especially for the heating of homes requiring not in excess of 600 sq. ft. of net water radiation. In accordance with the custom of this company, the ratings are given in net feet of standing radiation and the ability of the boiler is sufficient to take care of the necessary piping. Four sizes are listed, the smallest rated at 180 sq. ft. of steam radiation and the largest at 360 sq. ft. of steam radiation. Size 3 x 5 in. Pp. 8.

Pierce Junior Boiler

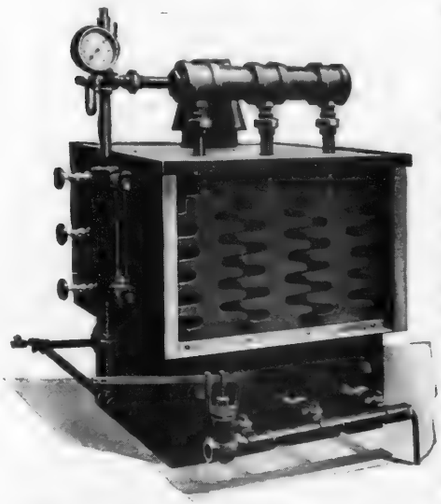
THIS IS THE PEERVENT HEATING AND VENTILATING UNIT is the title of an attractively-compiled circular, cut out in the form of a PeerVent unit and showing on different pages sectional views of the interior. Reference letters to the various parts of the unit are accompanied by corresponding text, explaining their construction and advantages. In this way, special attention is directed to the motor-driven multi-blade fan used with this unit, the air filters included in the equipment, the mixing dampers which swing back and forth under hand or thermostatic control, and the arrangements for discharging the air vertically into the room. The PeerVent radiator is illustrated, as well as the thermostatic control motor for the mixing damper. The unit includes a pneumatic control motor for the recirculation dampers and

hand control also is provided. An illustration of the unit with all the "works" removed is accompanied by the statement that the unit can be completely stripped and re-assembled again in three minutes. All parts for units of the same size, it is added, are perfectly interchangeable.

THE MUELLER RECORD for March, published by the Mueller Co., Peoria, Ill., is an interesting example of the evolution of the modern house organ. This issue contains 40 pages and in addition to the activities of the company, includes an interesting article on "The World's Water Supply" by Adolph Mueller, as well as one on the rapid development of gas as a fuel. The company's new athletic clubhouse for its employees is featured in a double-page spread, which includes both exterior and interior views of this building, which is the latest gift of the Mueller Company to its employees.

MCDONNELL & MILLER DUPLEX SWITCH FOR OIL-FIRED BOILER PROTECTION, through control of the motor current, is attractively presented in a 4-page folder, issued by McDonnell & Miller, Chicago, Ill. The circular shows very clearly the function, operation and construction of this unit, accompanied by full installation instructions. The unit itself is described on another page of this issue. Size 8½ in. x 11 in.

KANE AUTOMATIC GAS-FIRED BOILERS AND OFELDT AUTOMATIC GAS-FIRED BOILERS are featured in bulletins distributed by Mears-Kane-Ofeldt, Inc., Philadelphia, and Ofeldt Gas Boiler Sales Corp., Chicago. The affiliation of the Kane and Ofeldt organizations brings together two notable, highly-developed boilers, each of which has been on the market for a number of years and has been developed to a point of high efficiency. The Ofeldt boiler consists of a central vertical steel drum, surrounded by coils made of a special grade of pipe steel, 3 in. in diameter. They are coiled in helical form, tapping the drum at top and bottom and are so disposed as practically to interlace in the annular space around the drum. This design affords rapid circulation and the action is such that any sediment that collects does so in the bottom of the drum, rather than in any of the coils. These boilers are designed for pressures up to 300 lbs.

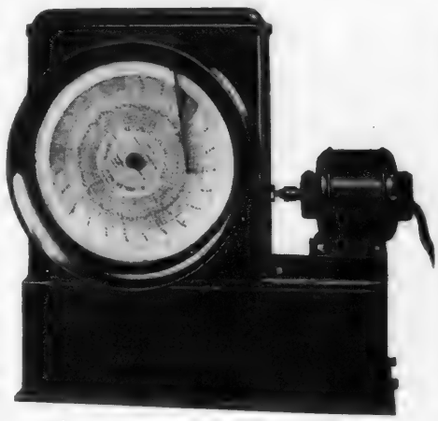


Kane Automatic Gas-Fired Boiler

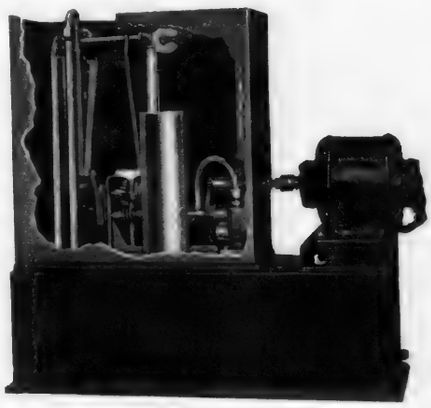
The Kane boilers are of the vertical fire-tube type and are extensively used in bakeries, hospitals, laundries, dyeing plants, dairies and other specialized industries. There is also described the Kane low water-line boiler, which is designed especially to operate on closed or direct return system, where it is desirable or necessary to locate the boiler on the same floor level with the devices using steam and yet have condensation return to the boiler by gravity. These boilers, built in sizes up to 7 H.P., carry a water-line only 22 in. high and are used in newspaper plants and printing establishments, restaurants and hotels. All of these boilers are designed for automatic operation with gas as a fuel. Information regarding these two lines of boilers is contained in several small folders and display brochures.

There is also featured the Kane automatic gas-fired house-heating boiler, which is built up in rectangular form of cast-iron, patented sections of such shape as to secure long gas travel. These burners are furnished in sizes to handle from 200 to 3000 sq. ft. of direct steam radiation.

CALOROIL BURNER appears on the cover of an exceptionally well-prepared catalog issued by The Caloroil Burner Corp., 5 East 40th St., New York. The material in the catalog is presented in a very interesting manner, aided by colored illustrations and drawings showing the functioning of the burner and its installation in typical high-class boilers. Several pages are devoted to photographs of homes which are heated with Caloroil burners and with these appear testimonial letters from the owners of the homes. Pictures are also shown of schools, apartment houses and commercial buildings with Caloroil installations. Five sizes of burners are listed capable of handling from 1200 sq. ft. to 6000 sq. ft. of steam radiation. Size 6 x 9. Pp. 32.



New Republic Motor-Driven CO_2 Recorder.



Mechanism of New Republic Motor-Driven CO_2 Recorder.

NEW REPUBLIC MOTOR-DRIVEN Co_2 RECORDER, recently brought out by the Republic Flow Meters Co., 2240 Diversey Parkway, Chicago, Ill., is the subject of a bulletin calling attention to the special features of this unit, one of which is that the entire mechanism is completely submerged in oil to reduce wear to a minimum and to eliminate corrosion. Another feature is the use of a small motor in place of water pressure, for operating the recorder. The folder describes in detail the mechanism of this instrument, as well as its operation.

HEATING BALTIMORE HOMES WITH GAS is the title of a little booklet prepared by the Industrial Fuel Department of the Consolidated Gas Electric Light and Power Co., Baltimore. Following the opening statement that "some 1300 Baltimore buildings are heated by gas-fired boilers," the booklet covers the high lights of the heating load developed by this company by pictures and text. Size 4 x 8. Pp. 24.

WEATHER VEIN, devotes No. 1 of Vol. 6, to an organization number telling in a biographical way of the personnel of the Carrier Engineering Corp., Newark, N. J. The biographical sketches of Willis H. Carrier and of his associates were written by Esten Bolling, formerly a member of the Carrier organization. These sketches are essentially intimate and evidently written with a very high regard for both the personalities and engineering accomplishments of the members of the staff. Willis Carrier is affectionately referred to as "The Chief," J. I. Lyle, treasurer and general manager, as "J. I.," while the secretary and chief engineer of the corporation, L. L. Lewis, is known to his associates as L^3. From reading *The Weather Vein*, one is led to look upon the Carrier organization as one of congenial spirits, with high ethical and engineering aims and ambitions, concentrating upon their chosen highly-specialized field, talents developed in the best technical colleges and practical workshops of the country.

HOT WATER INSTANTLY WITHOUT FURNACE, STOVE OR GAS BILLS, may be obtained through use of the Cid electric heater, described in a folder issued by the Cid Electric Heating Co., Inc., Indianapolis, Ind. This miniature instantaneous heater is attached to the wall above a basin. The water is drawn through the ordinary faucet through a flexible hose connection and current for heating water is obtained from any convenient outlet. Size 3 x 10. Pp. 8.

RADIAFIN TUBES are described in a circular recently issued by Schutte & Koerting Co., Philadelphia, Pa. These tubes, designed for heating and cooling air, are made in three sizes, 1¼ in., 2 in. and 3 in., in any length up to 15 ft.

S & K Radiafin Tubes for Heating or Cooling Air or Gases

with plain or flanged ends, with or without headers. They are designed for heating or cooling air or gases, the patented radial fins permitting a high transfer rate in a minimum space.

TURTLEBACK AIR DIFFUSERS are described in a catalog issued by Ventilating Products Co., Chicago. These ventilators are of the mushroom type, and are composed of two grey-iron castings, one constituting a floor flange and supporting spider, the other a cap fastened to the spider with a central screw, the head of which is flush with the top of the cap. A water stop is provided above the surface of the floor flange. Adjustment is made in 1/16-in. variation by rotating the cap, the under side of which contains three step-like ribs. By moving the cap and tightening the screw at the desired point, a firm seating of the notched element is obtained on the arms of the spider and the ventilator is then locked and cannot be loosened or rattled by knocking, jarring or kicking. The Turtleback is made in 6-in., 8-in., 10-in. round type and in 8 in. x 12 in. oval type. The catalog contains a list of theatres in which these ventilators have been installed.

A review of a recent bulletin of the Weinman Pump Manufacturing Company, which appeared in last month's issue, mentioned Cleveland, Ohio, as the company's address. It should be stated that the company is located in Columbus, Ohio.

TRANE HIGHEST-GRADE HEATING SPECIALTIES is the title of Bulletin No. 14, issued by the Trane Co., La Crosse, Wis. This bulletin embodies all of the information contained in earlier issues, with the addition of complete data on Trane high-pressure radiator traps and Trane blast traps. Size 8½ x 11. Pp. 28.

WHO SERVES BEST PROFITS MOST appears on the cover of an attractive catalog issued by Ernest E. Lee Co., merchant engineers, Chicago, Ill. This company exclusively represents a number of important concerns manufacturing equipment largely used in the boiler rooms of central and industrial power plants. The booklet briefly describes and illustrates the equipment. Size 8½ x 11. Pp. 16.

SMOKELESS CITY captions an attractive and elaborately-illustrated display circular issued by Kewanee Boiler Co., Kewanee, Ill. When opened, this circular is nearly a yard long and embodies a beautifully colored semi-sectional view of a Kewanee boiler, the cutaway portion showing the character of combustion in the fire box and the evolution of water in the boiler, with the steam rising from the water surface. Below the boiler is portrayed a hypothetical city with smokeless skies, presumably the result of Kewanee installations. On the opposite side are shown photographs of riveting details, shop scene and cutaway sections of the boiler, bringing out the salient points of construction and operation, the features also being described in the accompanying text. Size 8½ x 11. Pp. 16.

INTERNATIONAL CARTON SELF-CLEANING WARM-AIR FURNACE is featured in a new catalog issued by the International Heater Co., Utica, N. Y. Its unusual feature of construction is that the heater is narrowest at the base, with a gradual flare till the upper casting, the radiator, is reached. By this means, an increased heating effect is secured by the rising

How Radiator of Carton Warm-Air Furnace Telescopes Combustion Chamber

air. The design also provides for an unusual amount of prime heating surface. A distinctive feature of the heater is its self-cleaning radiator, so that soot

Top Section of Radiator of Carton Warm-Air Furnace

has no opportunity to reduce the heater's efficiency. The heater is made for both hard and soft coal. Size 8½ x 10½ in. Pp. 16.

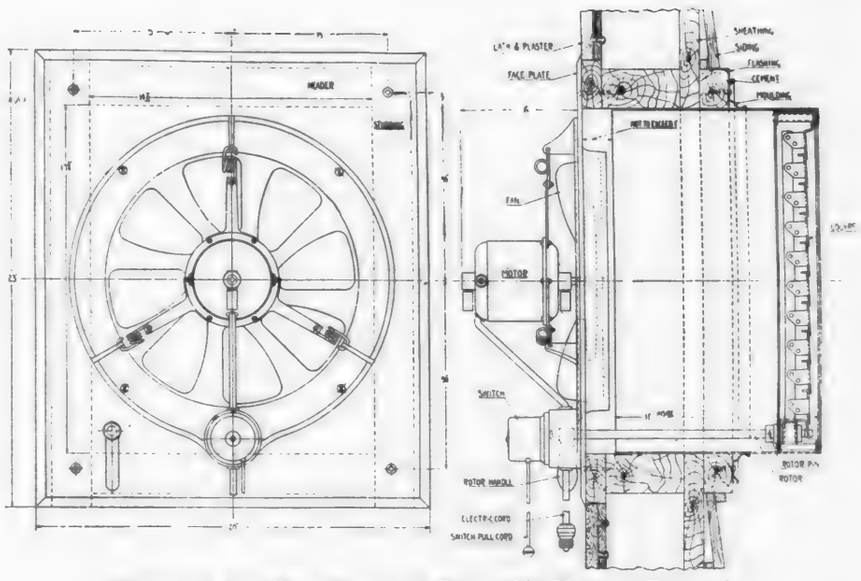
TRIUMPH MAGNETIC GAGES in several sizes and types are described in the circular issued by The Boston Auto Gage Co., Pittsfield, Mass. This is a line of leak-proof gages for use in domestic oil-storage tanks. There is no connection between the float mechanism and the indicating pointer, which is a compass needle. This needle is actuated by the revolution of a magnet under a solid diaphragm, so that the gage is free from possibilities of leakage, even if the glass would become broken.

HEAT YOUR HOME WITH A "SMOCK" is the title of a folder recently issued by Howard A. Smock, 439 Massachusetts Ave., Indianapolis, Ind. This circular describes a line of steel water heaters, designed for heating homes requiring 1000 sq. ft. of water radiation or less. The heater is constructed entirely of steel and is made in four sizes, having capacities of 400, 600, 800 and 1000 sq. ft. of radiation.

CLARAGE TYPE D AIR WASHER, featuring some of the notable installations of this equipment in such buildings as the Hotel Stevens, Chicago, the Palmer House, Chicago, and the East High School, Denver, Colo., is described in a new reference book (No. 72), issued by the Clarage Fan Co., Kalamazoo, Mich. The extent to which air washing equipment has been perfected is well illustrated in this apparatus, which is of compact and symmetrical design. The complete equipment consists of tempering coil, air washer, pump and motor, reheating coils, fan, motor or engine for driving fan, humidity control apparatus and duct work for air distribution. Special attention is paid to the details of construction of the Clarage standard Type B spray nozzles used with this apparatus, to secure a thorough atomizing effect at the nozzle opening, as well as uniform, undivided discharge. The equipment is guaranteed to remove 98% of all free, foreign matter, to cool the entering air 75% of the

initial wet-bulb depression, to remove all free or entrained moisture in the air, as well as to be first class in material and workmanship. General data and dimensions are given for a wide variety of sizes, with capacities ranging from 2920 cu. ft. per minute to 196,600 cu. ft. per minute. Size 8½ x 11 in. Pp. 24.

UNIVERSAL GAS BOILERS are described in a circular issued by Universal Smokeless Boiler Co., Ravenna, O. These boilers are built with patented cast-iron sections, so designed as to secure a maximum gas-travel. They are built in a number of sizes rated at from 380 to 5340 sq. ft. of steam radiation. They are made in two types, one in which the boiler is lagged with fire felt and covered with a metal jacket; the other is the same boiler without the metallic jacket, and suitable for conventional lagging on the job.



Method of Installing No. 2-1/3 Reversible Ventura Fan and Permanent Wall Fixture

WATERBURY SEAMLESS FURNACE is described in a catalog issued by the Waterman-Waterbury Co., Minneapolis, Minn. This catalog is aptly termed "The Furnace Man's Manual," as it contains much information of general value in regard to warm-air heating. An essential feature of the Waterbury furnace is the use of sheet-steel, with all joints electrically welded. There seems to be but little argument that this method of construction is gaining favor among the oil-burner manufacturers who are called upon to install burners in warm-air furnaces. The Waterman-Waterbury Co. has taken a forward step in developing a furnace specifically for use with oil-burners. The arrangement of doors, ash-pit and combustion-chamber are such as to make installations possible with the various types of burners on the market. The catalog contains full specifications of the Waterman furnace and of the accessories and supplies manufactured by its producer. There is also incorporated a section entitled "When and Where to Use a Pipeless Furnace" and another section dealing with the application of the standard code. Several methods for computing heat requirements are given, also much tabular information of a pertinent nature. Size 8½ x 11. Pp. 32.

Waterbury Seamless Warm-Air Furnace

MERCOIDS has been chosen as the title of a new house-organ of the Federal Gauge Co., Chicago. No. 1, of Vol. I, has, as its leading article: "Service—Shall It Make or Break Us?" by J. L. L. McCormack, vice-president of Hardinge Brothers, Chicago. The bulletin contains a number of interesting items regarding the use of Federal equipment and details of new equipment for boiler and furnace control. Size 8½ x 11 in. Pp. 4.

FITZGIBBONS BOILERS SUPPLY HIGH-PRESSURE STEAM FOR NEW MADISON SQUARE GARDEN is the title of a folder issued by Fitzgibbons Boiler Co., Inc., New York. On the cover appears an illustration showing five 225-H.P. Fitzgibbons boilers, operating at 125 lbs. pressure, supplying steam for the new garden. The catalog contains a brief but comprehensive description of the Fitzgibbons boiler and dimensional and ratings data on these boilers in sizes from 40 to 300 H.P.

FUEL-OIL BURNING IN NEW YORK CITY is a compilation of interesting and valuable data published by the Petroleum Heat and Power Co., 1775 Broadway, New York. This company, as a pioneer in oil burning in the metropolis, is well qualified by virtue of its large experience and because of its many important installations to discuss the question of the relative economies of burning oil and coal in such plants that furnish heat and power for the world's largest buildings. Such structures as the Metropolitan Life Insurance building, Equitable Life Insurance building, the Ritz-Carlton Hotel, Wanamaker Stores, the New York Times Annex, the Pershing Square Building and the Municipal Building of the City of New York are equipped with Petroleum Heat and Power Company burners and handled by its service. It is also noted in the text that the group of thirty-five buildings, comprising Harvard University has been heated with oil for the past five years, while Brown University buildings in Providence have been in successful operation for seven years. With such a background, it would appear that the detailed economic comparison between oil and coal presented in this brochure may be accepted without discount, as they represent actual, rather than hypothetical, cases. Several pages of "Answers to Questions About Fuel-Oil Burning" cover the essential points in a convincing way. The brochure concludes with a statement of the personnel of the company, the directorate of which includes many names of national prominence. Size 7 x 9. Pp. 16.

THE ADVANTAGE OF AGREEING WITH NATURE'S LAWS appears on the cover of an attractive catalog issued by the York Heating & Ventilating Corp., Philadelphia. The catalog is largely photographic in character and shows pictures of unit heaters through which smoke from specially-prepared bombs is blown and photographed to show the distribution of the air output. Typical examples are given of floor-type and ceiling-mounted heaters, and by means of phantom photographs with arrows drawn to indicate the actual movement of the air, the relative merits of the two types are portrayed. These photographs indicate a circulation with the overhead heater that is largely local in character, while with the floor type, blowing high-velocity air, the distribution may be made to cover any reasonable area. Un-

der the caption "Big Business Knows" is listed nearly a score of large business enterprises in the United States, in whose plants York welded-coil unit heaters are used. Size 8½ x 11 in. Pp. 8.

SAVE HOURS OF TIME AND TONS OF COAL appears on the cover of a pamphlet issued by Newport Boiler Co., Chicago. The pamphlet describes the operation of the Newport magazine-feed boiler, showing its adaptability to the use of the cheaper sizes of fuel and illustrates the general operating principles of the boiler.

HEATING WATER WITH WATER, is the title of an elaborate catalog issued by Bell & Gossett Co., Chicago. This catalog describes the construction and operation of Unitem submerged water heaters, which are designed for installation in connection with water or steam boilers, providing domestic service water. The catalog is replete with photographs and drawings covering all of the salient points of Unitem installations. On the last page appears a long list of owners of buildings in which this method of heating service water is used. The list is noticeable because of the fact that many of the owners have from three to eight different buildings so equipped, which fact would indicate satisfactory operation of this equipment. Size 8½ x 11. Pp. 16.

HALL-WILL is the trade name for a new line of pipe-threading machinery to be produced by Hall-Will, Inc., Erie, Pa., according to a newspaper report in the Erie Daily Times. A portable pipe-threader with a capacity of ¼ in. to 2 in. is now ready for the market and will be quickly followed by a larger machine, capable of handling up to 12-in. pipe.

LIGHT-RUNNING DUMOIN AIR-LINE PUMP is described in literature recently issued by Bangham-Beck Mfg. Co., Des Moines, Ia. This equipment consists of a tank, a heavy-duty vacuum pump, directly connected to a motor through a flexible coupling; also, the necessary vacuum gauge and controller and check valve. The DuMoin rotary air pump is of simple construction with only three working parts and is designed for high working efficiency and long life. The company also manufactures a vacuum return-line pump, which draws condensate out of the line and returns it to the boiler without a drop passing through the pump, which handles air only. This is accomplished by designing the air pump to act as either a vacuum or pressure pump. As a vacuum pump, it maintains the necessary vacuum on the receiver until it is almost full. The valve mechanism then automatically changes, so that the pump becomes a compressor placing a pressure on the receiver and forcing the water into the boiler. When the receiver has been emptied, the pump reverts to a vacuum pump.

THE SCIENCE OF HOUSE-HEATING is the title of a publication of the Farquhar Furnace Co., Wilmington, O. This Catalog is devoted to a complete and comprehensive discussion of the various phases of house-heating, and to a description of the "vent and return system." This system involves the distribution of warm air at comparatively low temperature to the various rooms through distributing leaders, with a return to the furnace, and a limited loss through vents connected with the living rooms. Where possible, fire places are used for the vents. It is claimed that a much more thorough distribution throughout the individual rooms is secured as a result of the operation of this system. The catalog then goes on with a description of the Farquhar furnace, which incorporates an electrically-welded steel fire-box of unique design. The fire-box and combustion chamber are merged in a streamline section, around which air from the cold-air box circulates. Due to the shape of the combustion chamber, an intensive "scrubbing" action is secured, resulting in a high transfer of heat. The catalog is exceptionally well illustrated with photographs and drawings. Size 9 x 9 in. folded. Pp. 16.

SIMPLEX HEAT REGULATOR is described in a small circular issued by the Simplex Heat Regulator Co., Minneapolis, Minn. This circular points out the advantages accruing to the home owner who installs the Simplex heat regulator for the control of his heating plant. The equipment consists of a clock-controlled thermostat, and a spring-type motor installed in the basement for the operation of the boiler dampers. Size 3 x 5 in. Pp. 8.

LITTLE GIANT RADIATOR TRUCK is described in a folder and circular received from the Little Giant Mfg. Co., Minneapolis, Minn. This is a truck of special design built to handle radiators. The truck is equipped with rubber tires for use on finished floors and has a capacity of 1000 lbs. It will handle a 4-col. 45-in. radiator or a 13-in. wide window radiator. The truck weighs less than 200 lbs. With the radiator upright, the truck is pushed into position straddling it. The chains suspended from the two pulleys are then hitched about the radiator, which is hoisted into position by cranking the windlass. This would appear to be a valuable adjunct to equipment for the installation of radiators in jobs of considerable size.

UNISHEAR ELECTRICALLY-OPERATED WONDER SCISSORS are described in a folder issued by the Unishear Co., Inc., New York. The Unishear is an electrically-driven machine for cutting sheet metal and is designed to do both straight and irregular cutting rapidly without leaving burrs or distortion. It will handle small as well as large sheets and is adaptable for cutting corrugated sheets or finishing the ends of sheet-metal pipe to irregular outlines. Being a self-contained unit, the motor and cutting mechanism are mounted on one base, and weighing but 50 lbs., it is portable and can be installed wherever there is an electric current connection. Operation, it is stated, is very simple. The cutting line is visible at all times to the operator, who has only to guide the sheet he is cutting, a slight pressure being of sufficient assistance to the inherent feeding action of the jaws to carry the work along. When the pressure stops the cutting stops. The cutters operate with an oscillating movement, facilitating the making of a clean, continuous cut, and revolve at a speed of 1250 r.p.m. They are connected with reduction gearing to the motor by means of a flexible coupling. All gears are of hardened steel, running in grease on ball bearings. They are readily accessible.

The Unishear will handle steel sheets up to No. 14 U. S. gauge and copper, etc., up to No. 12 U. S. gauge. It is designed to operate at a cutting speed of 15 ft. per minute. All usual motors to meet varying cycle and voltage demands are carried and special motors can be furnished for unusual conditions.

GASCOLA is the trade name given to gas-fired parlor heaters manufactured by the Franklin Gas Burner Mfg. Co., Cincinnati, Ohio. The Gascola burns gas or coal or both and is manufactured in two models, one with a grained mahogany finish on steel and the other of polished steel with nickel trimming. The circular describes the important features of the Gascola and is illustrated with diagrams and photographs.

DO YOU USE YOUR PLANT NEWSPAPER? is the title of a well-compiled booklet issued by the C. J. Tagliabue Mfg. Co., 18-88 33rd St., Brooklyn, N. Y. "The plant newspaper" is the designation given in the manual to the company's line of recording instruments in which the analogy of the records obtained by recorded instruments and the service of a daily newspaper are cleverly compared. Size 3¾ x 9 in. Pp. 24.

CHALMERS OIL BURNER is the title of a catalog recently issued by Chalmers Oil Burner Co., Minneapolis, Minn. It describes the new Type 3-B Chalmers burner, which is a full automatic, atomizing type, adapted to household boilers having grate areas up to 12 sq. ft. The catalog is well illustrated with photographs and diagrams showing the principle of operation and the details of the burner.

Deaths

JOHN T. DYAS, the former president of the Heating and Piping Contractors New York City Association, and at the time of his death manager of the New York branch of the Grinnell Co., Inc., died April 12. He was 74 years old and had been connected with the Grinnell Company, formerly the General Fire Extinguisher Co., since 1892.

After 28 and 30 years of Continuous Service we get reports like this

The Heating & Ventilating Engineer who recommends temperature regulation for his clients on a basis of results and not on the first cost alone, will find his specification of the Powers System of Temperature Control supported, time after time, by such evidence as that given in the accompanying letter from the Superintendent of Buildings of the Evansville (Ind.) Public Schools.

In the Centennial School the installation was made 28 years ago; in the Stanley Hall School 28 years ago; and in the Delaware School 30 years ago. And the Superintendent of Buildings, Mr. Charles T. Bush, says: "The cost of upkeep has been so light that I don't think it worth mentioning."

Which is one more experience to prove that the Powers System may be counted on to give long years of uninterrupted service without frequent "service" bills for adjustments and repairs.

The secret lies in the Powers Vapor Disc Thermostat, which is as ready for service in the fall as it was when the fires went out in the spring. No adjustments are needed—no repairs called for.

Our Book "The Elimination of Heat Waste", shows how and why the higher first cost of a Powers System is justified in the end. Sent free to any engineer or draftsman upon request.

Public Schools
Office of the Business Manager
Evansville, Indiana

January 22, 1926.

Powers Regulator Co.,
Chicago, Ill.

Gentlemen:

Answering your letter inquiring about the Powers Service in three of our old schools, will answer:

The temperature control in the Centennial School, Stanley Hall School, also the Delaware School, has been giving perfect satisfaction. The cost of upkeep has been so light that I don't think it worth mentioning. If I have the say about temperature control, I would have no other.

Very truly yours,
Chas. T. Bush,
Supt. of Bldgs.
Evansville Public Schools.

THE POWERS REGULATOR COMPANY

35 years of specialization in temperature control

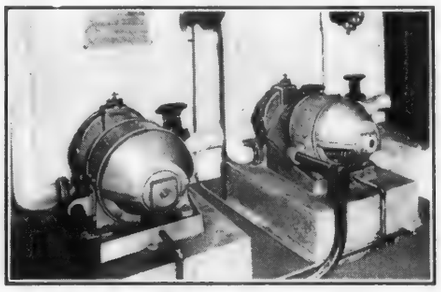
2718 Greenview Ave., Chicago

Atlanta	Charlotte, N. C.	Detroit	Los Angeles	New York	San Francisco	Seattle
Baltimore	Cincinnati	El Paso	Milwaukee	Philadelphia	CANADIAN OFFICES	
Boston	Cleveland	Houston	Minneapolis	Pittsburgh	Toronto	Winnipeg
Buffalo	Denver	Indianapolis	Nashville	Rochester	Montreal	Calgary
Butte, Mont.	Des Moines	Kansas City	New Orleans	St. Louis	Halifax	Vancouver

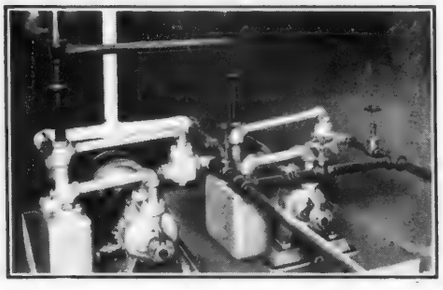
(3398)

MAYFAIR HOUSE, 610 Park Avenue, New York, N. Y.—one of New York's prominent apartment hotels. Mr. J. E. R. Carpenter, Architect, New York, N. Y.; Mr. E. A. Kingsley, Consulting Heating Engineer, New York, N. Y.; Almirall & Co., Inc., Heating Contractors, New York, N. Y.

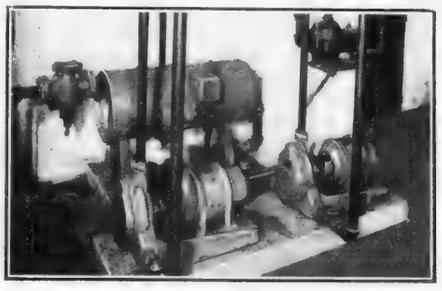
BELOW—Views of the Jennings Pumps installed in Mayfair House.



The two motor-driven Jennings House Service Pumps.



The two motor-driven Jennings Sewage Ejectors.



Two motor-driven Jennings Condensation Pumps, handling the condensate from the steam heating system. Note the strainer for protecting the pumps against scale and dirt; and the horizontal receiving tank.

Mayfair House

—restricted to the right pumps as well as to the right people

When you appreciate the exclusiveness which Mayfair House enjoys,—exclusiveness as to the building and its appointments, its location, and the character of its tenants—you immediately realize why only Jennings Condensation, House Service and Sewage Pumps are installed.

Here, service to the building's patrons is a matter of foremost importance. And any equipment, as for example the condensation heating pump which is so vital a factor in contributing to the comfort, convenience and good health of the occupants, must be the best obtainable.

It is logical, therefore, that Mayfair House, like so many other fine buildings, insists on the kind of service Jennings Pumps give.

NASH ENGINEERING COMPANY

So. Norwalk Connecticut

Branch Sales Offices in: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington.
In Canada: Montreal, Toronto and Vancouver.

Jennings Pumps

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

Trade and Miscellaneous Notes

Coming Events

June 22-24, 1926.—Forty-fourth annual convention of the National Association of Master Plumbers at Louisville, Ky. Headquarters at the Brown Hotel.

Miscellaneous Notes

New York.—Steamfitters and helpers in Greater New York, who had been on strike since March 29, signed an agreement May 2 to continue until 1928 on the basis of $12 a day for steamfitters from May 1, 1926, to December 31, 1927, and $8 to $8.50 a day for helpers from May 1, 1926, to December 31, and a minimum wage of $9 a day for 1927. The disagreement was between the Steamfitters' Local 638 and the Heating and Piping Contractors' Association and it is understood that the settlement was satisfactory, due to the intervention of John Coefield of Chicago, international president of the Plumbers and Steamfitters' Union. Both sides made concessions and it is understood that both parties to the agreement are reasonably satisfied with the result. As the building contracts in the area affected aggregate three-quarters of a million dollars, considerable relief was felt throughout the allied industries at the settlement.

National Association of Master Plumbers' Scholarship Fund has been enriched to the extent of $20,000, which comes from an anonymous donor, with the suggestion that the income be used to finance two boys who may matriculate during the fall of 1926 and each four-year period thereafter in the prescribed four-year course in plumbing at Carnegie Institute of Technology, or any other institution that may be hereafter designated by the National Scholarship Committee. In a letter transmitting this gift, the donor states that it is in honor of his father, who at one time was a master plumber in New York. Such donations as this enable the boy of today to secure training and education as a plumber on a breadth never dreamed of in the boyhood days of the donor's father.

Second Annual Western Power Show for Chicago and adjoining territory will be held in the Coliseum Building, Chicago, February 15 to 19, 1927. The show is being planned on a much larger scale than was the previous exposition and the unbroken floor space of nearly two acres in the Coliseum affords every opportunity for a fine display. A conference room, with a seating capacity of 1200, will be available for engineering meetings which will be held in conjunction with the power show. This hall probably will also be utilized for the power conference, which will be held during the same week in Chicago.

$165,000,000 public building program, now pending before Congress, has passed the House and is expected to be favorably reported to the Senate and will come to an early vote. The bill provides for new construction work outside of the District of Columbia, amounting to over $100,000,000 and half as much within the District. The Civil Service Commission has extended until June 30 the date for the close of receipt of applications for architects, associate architects, assistant architects and associate and assistant architectural, mechanical and structural engineers in connection with this work. Application blanks and information may be obtained from the United States Civil Service Commission, Washington, D. C., or from the secretary of the United States Civil Service Board, through the post-office or custom house in any city.

Heating and Piping Contractors Pittsburgh Association has elected the following officers: President, J. J. Sneider; vice-president, Thomas H. Hester; secretary and treasurer, J. B. Walker. Board of trustees: John McMurray; Peter O'Neill, and J. E. McGinness.

For Those Hot Weather Days Ahead

This is the Fan to SELL!

EXCLUSIVE PATENTED FEATURES

RIGIDLY GUARANTEED THROUGHOUT

AUTOVENT—*"The Well-Built Fan"*

MOTOR—The enclosed, protected type motor is of special Autovent design. It is radiation cooled by patented process.

BEARINGS—Constructed of cast bronze alloy having large wearing surface. Self-aligning and interchangeable.

WHEEL—Bored and reamed hub to which steel spokes are securely riveted. Blades and spokes oxy-acetylene welded and riveted to outer rim. All wheels accurately balanced.

SHAFTS—The shafts are of extra quality shaft steel and are ground to fit the bearings.

INSTALLATION—Easiest to install. Fan frame can be installed separately, allowing motor and wheel to be inserted later. The weight of fan for installing is thus greatly reduced.

GUARANTEE—The complete unit, fan and motor, supplied and rigidly guaranteed by us. You can rely on us for absolute responsibility.

AUTOVENT FAN & BLOWER CO., 730-738 W. Monroe St., CHICAGO

OFFICES IN ALL PRINCIPAL CITIES

American Arbitration Association, 342 Madison Avenue, New York, has been organized to take over the activities of the Arbitration Society of America, Inc., and the Arbitration Foundation, Inc. A program is now being perfected to maintain an information and consultative service to trade associations interested in creating or developing their own arbitral machinery and in promoting the general use of arbitration among their members in business disputes. Joseph Mayper is the Secretary of this Trades Division.

Washington, D. C.—According to the United States Civil Service Commission, the $165,000,000 Federal building program, legislation for which has passed the House, and is now before the Senate, will require the services of fifty or more associate construction engineers for field work in addition to the architects, architectural engineers, mechanical engineers and structural engineers now being recruited for employment in the office of the Supervising Architect in Washington. Until April 27 the Civil Service Commission will receive applications for posts of associate construction engineers for duty in the field. The entrance salary is $3,000 a year. Higher salaried positions are filled through promotion. These field construction engineers will be in responsible charge of the erection of Federal buildings constructed by private contractors. Applicants will not be required to report for examination at any place, but will be rated on evidence of their education, training and experience.

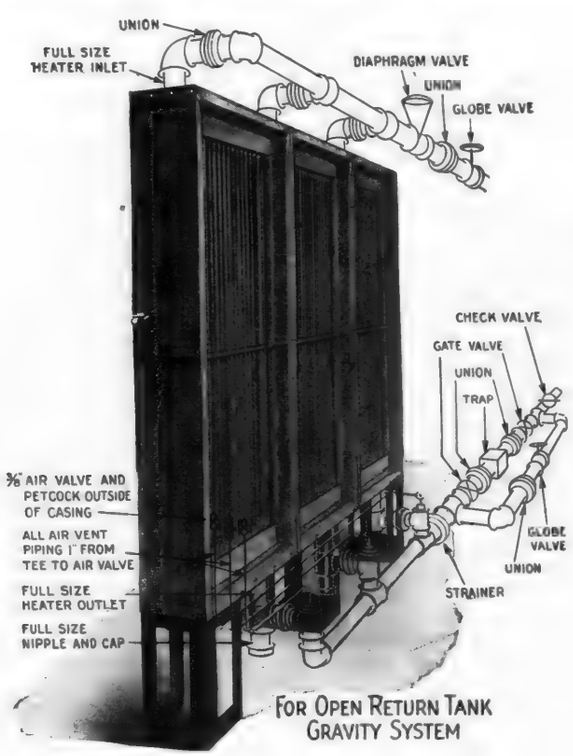
St. Louis, Mo.—The Heating and Piping Contractors St. Louis Association, in its fight for separate specifications and separate contracts for the mechanical equipment of public buildings in St. Louis, has succeeded in securing this separation on several buildings for which general contracts have recently been let.

Western Trade Golf Association added 43 names to its membership list at its first 1926 golf tournament, held at the Wilmette Golf Club, May 11. Sixty-five players turned in scores. Prize winners included J. M. Grace, who had the low net score, R. Cooper, Jr. and W. B. Dale, who tied for second place, Mr. Dale winning the toss for this prize; Charles W. Bishop, and R. M. Hubler. The duffer's cup was won by H. A. Claussen. W. F. Thumm and C. E. Price tied for the blind bogey prize, donated by E. W. Sanborn. Mr. Price won the toss. James Miller won the guest prize with low score. The association, by a standing vote, adopted resolutions on the death of Clarence V. Kellogg. A vote of thanks was given Clinton E. Beery for the arrangements made by him at the club for the tournament.

St. Louis, Mo.—In connection with a city-wide smoke abatement campaign, President E. B. Langenberg of the National Warm-Air Heating and Ventilating Association, made the statement that more than 75% of the smoke flues in St. Louis are inadequate for proper combustion. It was brought out at a meeting of smoke abatement committees that the city's present smoke ordinance does not provide for flue regulation or inspection. A vigorous smoke abatement campaign is planned.

Reno, Nev.—Authorization of the employment of an engineer to draw plans for enlarging the University of Nevada's heating plant has been made by the university regents and the selection of an engineer left to Walter E. Pratt, chairman of the regents, and Walter E. Clark, president of the university. The plant will cost $35,000 and will heat all of the university buildings from a central station.

Chicago Association of Consulting Engineers elected the following officers at its recent annual meeting: President, John Small; vice-president, I. Brooke; secretary-treasurer, George A. Muir. At this meeting, it was voted that the society call a meeting of the various organizations in Chicago interested in good ventilation for buildings and in amending or changing the present ventilation code of the city.



AEROFIN CORPORATION
750 Frelinghuysen Avenue
Newark, N.J.
L. C. Soule, *Sec'y and Sales Manager*

AEROFIN

Fan-System Heating Surface

To Engineers, Architects and Contractors

THREE YEARS OF SUCCESSFUL SERVICE demonstrates that AEROFIN has established itself as a dependable product.

ENGINEERS OF NATIONAL REPUTATION AND TWENTY YEARS' EXPERIENCE WITH FAN SYSTEM HEATERS, are responsible for the design, development, manufacture and marketing of AEROFIN, and their services are at your command to assist you in working out your heating, ventilating, cooling and drying problems.

SINCE THERE IS NO EQUAL TO AEROFIN, WHY NOT SPECIFY IT OUTRIGHT? Plans and specifications should show sizes and number of units, with piping details.

AEROFIN HAS A TREMENDOUS ADVANTAGE in its LIGHT WEIGHT. AEROFIN weighs only 9% to 25% as much as the old-fasioned heavy heaters. AEROFIN SAVES A GREAT DEAL OF SPACE.

AEROFIN IS MADE OF NON-CORROSIVE METALS. This feature meets with universal approval.

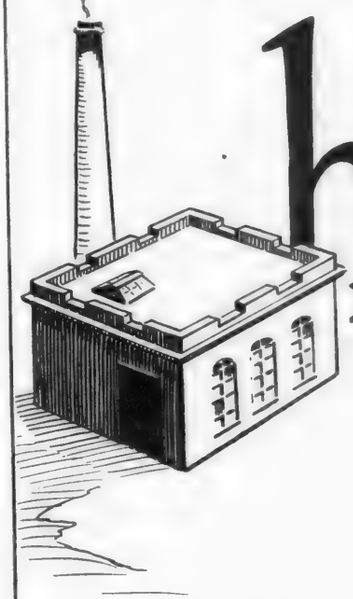
THE INSTALLED COST OF AEROFIN IS GENERALLY LESS than that of cast-iron heaters and pipe coils. AEROFIN (completely encased) can be erected in the same number of HOURS as is required in DAYS to erect the heavy heaters. This means a great saving in erecting cost.

THE INSTALLATION OF AEROFIN WITH VERTICAL TUBES IS RECOMMENDED as this arrangement is less subject to errors of installation and operation. THE HORIZONTAL TUBE ARRANGEMENT is satisfactory when installed in accordance with our instructions and diagrams.

Write for catalog, instruction leaflet and service details.

Aerofin is Sold ONLY by Manufacturers of Nationally Advertised Blower Heating Apparatus.

To get your steam from here to here



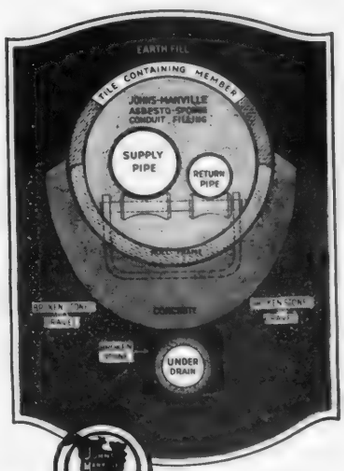
—use this efficient and economical system

AT less than half the cost of a walking tunnel, the Johns-Manville Underground System of Insulation offers you a highly efficient method of getting steam and hot water underground from one building to another.

Constructed according to the highest engineering standards, its efficiency is guaranteed to be at least 90%. It couples an efficient plant to an efficient distributing system, resulting in the maximum economy in heating service.

A book completely describing this system, including photographs and interesting data on the big 19,400 ft. installation at Cornell University, should be yours for reference. You will want this book. Send us your name and we will mail it to you.

JOHNS-MANVILLE INC., 292 Madison Ave. at 41st St., New York
Branches in all large cities For Canada: Canadian Johns-Manville Co., Ltd., Toronto



Through—
Asbestos
and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Underground System of Insulation

John Fraser, Jr., president and treasurer of the Milwaukee Valve Co., Milwaukee, Wis., has been elected vice-president of the Milwaukee Athletic Club.

Manufacturers' Notes

The 1926 meeting of the national representatives of Pecco, Incorporated, manufacturers of the Pecco line of unit heaters, ventilators and dust collectors, was held in St. Louis, March 25-27.

After spending a day at the plant, where Mr. Edward P. Puhl, president of the company, spoke on "Selling Heaters" and commented on the various selling features of Pecco construction, a tour of the city was made and some of the more prominent Pecco installations were inspected.

Fitzgibbons Boiler Co., Inc., New York, announces the removal of its New York City executive and sales offices to 570 Seventh Avenue, near 41st Street.

Socony Burner Corp., New York, has removed its headquarters to 7-21 North 12th St., Brooklyn, N. Y.

Vapor-Vacuum Heating Co., New York, announces that the Automatic Fuel Saving Co., 2539 N. 26th St., Philadelphia, will handle the sale of its specialties in the Philadelphia territory. R. O. Kriebel, secretary of the Automatic Fuel Saving Company, was formerly connected with the Vapor-Vacuum Heating Company.

Kieley & Mueller, Inc., New York, manufacturers of steam, water and air specialties, advise that they are represented in Chicago and northern Illinois by the Barrett-Christie Co., 37 South Clinton Street.

Continental Heater Corp., Dunkirk, N. Y., is now represented in Chicago by F. M. Minninger, Strauss Building, 310 South Michigan Avenue.

Jos. W. Hays Corp., Michigan City, Ind., manufacturer of CO_2 recorders and other combustion instruments, announces a change in name to The Hays Corporation. Mr. J. W. Hays, who founded the business nearly twenty years ago, has disposed of his entire holdings in the company and will devote his time to consulting engineering. Philip T. Sprague, formerly vice-president and general manager, has been elected president of the new corporation.

Federal Gauge Co., Chicago, announces the election of Wallace C. Capen as vice-president. Mr. Capen has a wide experience and many friends in the heating industry through his former associations.

American Radiator Co., recently moved the headquarters organization of its Specialties Department from Buffalo to Chicago between the close of business on Friday and the opening of business on Monday. This department is now located at 816 South Michigan Avenue, Chicago.

Kewanee Boiler Co., Inc., Kewanee, Ill., has moved its executive and New York City sales office to the Cowan Building, 570 Seventh Avenue, New York.

Hoffman Specialty Co., Inc., New York, announces the following changes in regard to personnel: I. H. Vogel, having headquarters at 76 Johnson Park, Buffalo, will represent the company in Hamilton, Toronto and London, Ont., also in Western New York and in the northwest counties of Pennsylvania. W. A. Murphy, with headquarters in Harrisburg, Pa. will represent the company in Central Pennsylvania, Baltimore and the territory in Maryland north and northwest of Baltimore. Mr. Murphy will also handle a portion of West Virginia.

O-E Specialty Mfg. Co., Milwaukee, Wis., has established sales offices in Tokyo, Japan, under the management of Ryoeki Shokai. The offices will be located at 1 Himono-Cho, Nihonbaski-Ku, Tokyo, Japan, where a full stock of heating specialties will be carried for distribution throughout Japan.

TWINFAN Unit Heaters

FLEXIBILITY

One of the Features of Twinfan Unit Heaters

TWINFAN Unit Heaters can be practically used as a ventilating system during the warm weather as well as take care of the rapid rise and fall of outside temperature during the long winter season.

It takes hours for a direct radiation system to heat up or cool off and meanwhile workers in factory or garage are uncomfortable in a stuffy or cold atmosphere.

No opening or closing of windows is necessary to make the room comfortable with the Twinfan Unit Heaters. Simply turn the switch and practically all the heat is turned off. It is just as easily turned on again when needed.

The Twinfan occupies little floor space. Yet one unit is equal to the capacity of seventeen radiators, with a corresponding saving in installation cost.

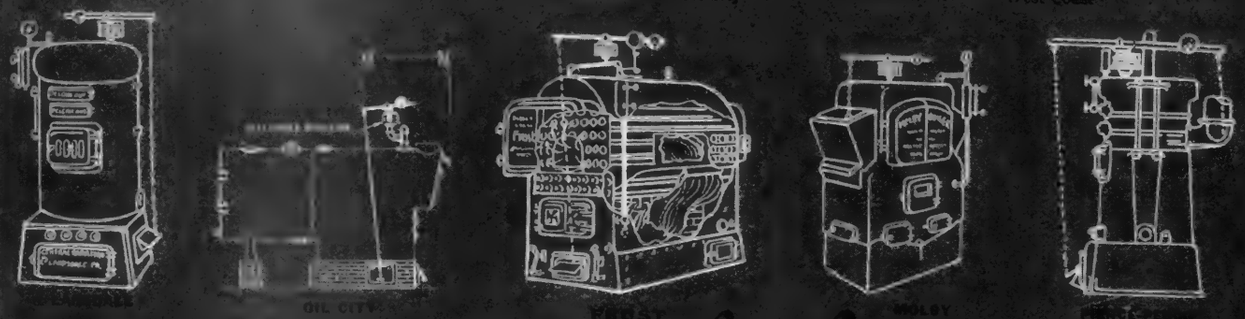
We will be glad to co-operate with you on any public garage or industrial heating job.

A Twinfan Unit in plant of Gill Manufacturing Co., Chicago. Note work benches tight against heater, also refuse barrels underneath.

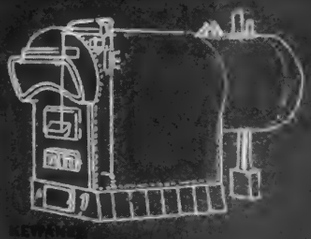
DWYER EQUIPMENT COMPANY
4534 W. NORTH AVE. CHICAGO, ILL.

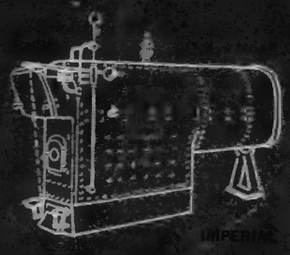
Standard Equipment on all these Boilers

Abendroth	Coatesville	Heggie-Simplex	Kewanee	Otis-Sawyer-	Ross
Ames	Congress	Imperial	L-O	Economy	Senate
Birchfield	Fitzgibbons-	International	Lansdale	Pierce-Pebco	Spencer
B-Line	Ontario	Economy	Moby	Putnam	Standard
Burnham	Floral City	Keysco	Noveity	Richardson	Star
Coil	Freed	Keystone	National	Richmond	Thatcher
			Oil City		West Coast

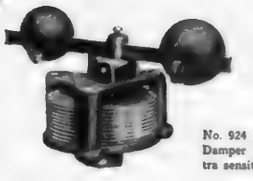


Sylphon

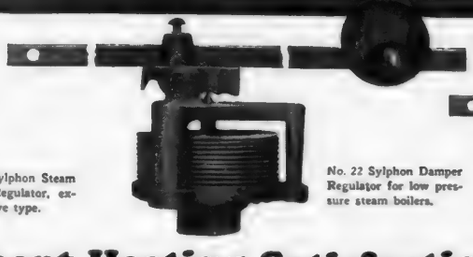




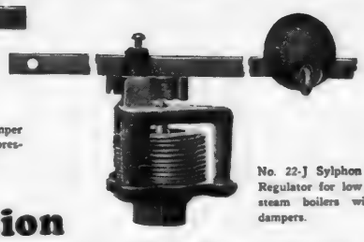
Steam Damper Regulators



No. 924 Sylphon Steam Damper Regulator, extra sensitive type.



No. 22 Sylphon Damper Regulator for low pressure steam boilers.



No. 22-J Sylphon Damper Regulator for low pressure steam boilers with light dampers.

Give Permanent Heating Satisfaction

That Sylphon Damper Regulators meet the most exacting demands of sensitiveness and reliability, over a long period of service, is evidenced by the fact that they are standard equipment on the 35 leading boilers listed above.

The diaphragm used is the well-known Sylphon Bellows, which opens and closes draft dampers in **continuous** and **proportionate** response to changes in steam pressure, without a trace of lag behind pressure variations. You want the boilers you install to give long and satisfactory heating service. Equip them with Sylphon Damper Regulators and insure years of satisfaction without servicing changes. Refuse imitations. Insist upon the genuine.

Every genuine Sylphon bellows is drawn and formed seamless from a flat sheet of specially prepared metal, with folds or corrugations formed to provide the greatest strength and flexibility.

This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL SEAMLESS SYLPHON BELLOWS
Sylphon

Let us send Bulletin WDR-5.

Breakdown, so common with the ordinary type of thermostat is eliminated, for neither years of constant use nor the powerful action of steam weaken the Sylphon bellows.

THE FULTON COMPANY KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

SALES OFFICES IN: New York Chicago Detroit Boston Philadelphia
and all the Principal Cities in U. S.

European representatives: Crosby Valve & Engineering Co., Ltd. 41-42 Foley Street, London, W. 1, England

Canadian representatives: Darling Bros., Ltd. 120 Prince Street, Montreal, Canada

Hall-Will, Inc., Erie, Pa., recently organized, will place upon the market a comprehensive line of small portable electric pipe-threading machines, to be marketed under the trade name of Red-E-Hall. This will be followed by a line of larger productions, in the form of precision pipe machines. The leading members of the organization are Leslie Hall, president, and C. Frank Williams, vice-president, both widely-known in the machine-tool industry.

Chicago Association of Consulting Engineers elected the following officers at its annual meeting: President, John Small; vice-president, I. E. Brooke; secretary-treasurer, George A. Muir. It was voted at this meeting that the society call a meeting of the various organizations in Chicago interested in good ventilation for building, and in amending, or changing, the present ventilating code of the city.

National Trade Extension Bureau announces that W. C. DeBold has become associated with the bureau as field representative for the Accounting Service Department. Mr. DeBold has had a wide experience in this field, having been associated with the Missouri Pacific Railway Company, the Bell Telephone Company and later, with the Baker-Vawter Company, public accountants. He then took charge of the office of accounting system of the Stewart Land Company and developed an accounting system for this firm which handles a business of about $15,000,000 a year. For the past two years, Mr. DeBold has been connected with the Kansas City, Mo., Association of Plumbing and Heating Contractors as auditor and assistant secretary. While connected with this association, he trained nearly 200 master plumbers, heating contractors and their bookkeepers in the T.E.B. system of accounting. With this experience, Mr. DeBold will undoubtedly be of great value to the association and to its members who may avail themselves of his services.

Rcbert June Engineering Management Organization, Detroit, has moved to larger quarters at 2208 West Grand Boulevard. This is the organization's fourth move in as many years, and each time to larger quarters.

Frank Hodson, consulting engineer, 1015 Chestnut St., Philadelphia, has secured exclusive rights to the Kaelin electric steam boiler for the United States and South America. It is understood that over $500,000 K.W. in these electric steam generators have now been installed.

Webster Tallmadge, engineering specialist, 50 Church St., New York, announces the association with him of M. T. Martin, formerly of the Turbine Engineering Department of Westinghouse Electric & Manufacturing Company.

April Building Construction declined slightly, according to report of the F. W. Dodge Corporation. Contracts awarded in the 37 States east of the Rocky Mountains amounted to $571,000,000, which was a decrease of nearly 5% from the preceding month and an increase over April of last year of less than 1%.

Total building and engineering contracts awarded during the first four months of this year aggregate over $2,000,000,000, the largest amount yet reported for a similar period of any year. The increase was approximately 20% over the first four months of 1925.

"Inspection and Ventilation" is cited by two unknown authorities as constituting one of five causes of the common cold, according to an editorial evidently of the boiler-plate variety, clipped from a California paper. The editorial is not at all particular as to the variety of ventilation that should be avoided, but states that "ventilation is regarded as the commonest of all causes. . . ." The question is, where does such stuff come from?

Central Station Heating Notes

Newark, O.—A plan is on foot to install a central steam heating plant in Newark to be operated from the plant of the Ohio Power Company, which maintains a large electrical generating plant in this city. The company recently engaged R. A. Heibtrink, a heating engineer, to make a survey and tentative plan for taking care of the business in what is practically the fire zone of the city. The plan is to furnish steam to all consumers in this zone and to nearby buildings. If the system is installed, it is planned to extend a 24-in. main from the plant to various branches in the district to be covered.

New Corporations

Gulf Oil Burner Co., Frick Building Annex, Pittsburgh, Pa., a subsidiary of the Gulf Oil Corporation of Pennsylvania, has been incorporated to manufacture and sell a line of domestic oil burners. President, George H. Tabor; vice-president, Charles E. Berger; secretary, W. J. Guthrie; treasurer, J. E. Nelson.

Consolidated Boiler Corp., Benton Harbor, Mich., capital $150,000, to manufacture steam and water boilers. The principal stockholders are Harry V. Tutton and Adolph T. Johanson, of Benton Harbor.

Northlite Burner Corp., Boston, Mass., to deal in heating appliances. Incorporators: Gustav A. Bergfors, president; Joseph E. Ludden, treasurer, and Richard C. Evarts, secretary. The treasurer's address is given as 413 Sears Building, Boston.

Metropolitan Oil Heating Co., Inc., Cambridge, Mass., capital $25,000. Incorporators: Harry J. Dony, Carl J. Appelt, 881 Massachusetts Avenue, Cambridge, and Alvah G. Sleeper.

Organization of Evins F. Glore & Son

Evins F. Glore & Son, Inc., Grand Central Terminal Building, New York, has been organized by Evins F. Glore, for the past seven years vice-president and general sales manager of the Abram Cox Co., Philadelphia, and for many years previously a well-known figure in the heating and plumbing industry. Associated with Mr. Glore is his son, A. R. Glore, who graduated from Princeton in 1924 and was for some time in charge of the New York office of the Abram Cox Company. The new firm will specialize in heating and ventilating equipment and will operate in the Greater New York district.

OFELDT GAS BOILERS

Raise Steam in 4 Minutes—Cost Less to Operate

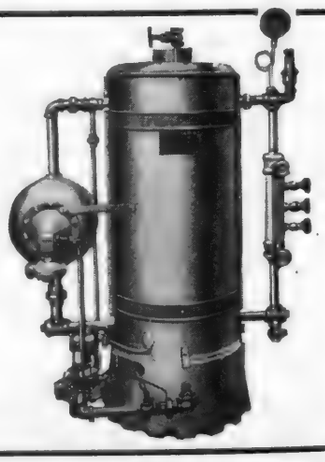
On that next job specify the Ofeldt

Whether your customer requires only 5 or 150 lbs. of steam working pressure—OFELDT Gas Boilers will never fail to satisfy. Their record of low cost of operation in thousands of plants, their dependable automatic control, have made it possible to enjoy the use of gas. Raising steam in four minutes, saving space, labor and improving the working conditions are items that every plant owner is interested in. The OFELDT Automatic Gas Boiler makes this an actual reality. Made in sizes 1 to 25-H.P.

Write today for full particulars

Ofeldt Gas Boiler Sales Corp.

St. Louis, Mo. 2010 Locust St. | 363 W. Erie St., Chicago, Ill. | Birmingham, Ala. American Trust Bldg.



Only Three Points of Contact

YOU'LL save money by saving the time usually wasted in setting radiator brackets on uneven walls. The new Grinnell Column Radiator Brackets effect this economy, for they have only three points of contact and require only one bolt for securing them to the masonry.

What's more, they can be installed without careful, time-consuming measurements, due to their wide adjustment, both vertically and horizontally.

We'll be glad to send you a pamphlet illustrating this sturdy new bracket and giving dimensions and list of sizes in which it is available. Address Grinnell Company, Inc., 275 W. Exchange Street, Providence, R. I.

GRINNELL

Fittings, Hangers, Valves, Pipe Bending Welding, Piping Supplies, Etc.

Contracts Awarded

Arthur McKinley Plumbing & Heating Co., Kansas City, Mo., heating the Northeast Junior High School for $55,555; the plumbing contract went to the MacMahon Company, at its bid of $32,600.

Hoffman Co., Wichita Falls, Texas, heating and plumbing new Holt Hotel, for $42,483.

E. L. Veale, Abilene, Texas, heating and plumbing new hotel in Fort Worth, at Commercial and College Avenues, for $18,400.

McGinn & Reich, Knoxville, Tenn., heating and plumbing new $260,000 Central Methodist Church, in Knoxville.

A. D. Rose, New Orleans, La., heating Saenger Theatre at Canal and Rampart Sts. for $41,893.00; also heating Pierre Marquette Building, at Barrone and Common Sts. for $46,871.00.

Business Changes

Carthey Plumbing Co., Salt Lake City, Utah, is the new name of Carthey & Dumbeck, Inc. The company has conducted a heating and plumbing business in Salt Lake City for the past 36 years. No change has been made in the management. An enlarged stock will be carried of heating and plumbing supplies.

Canfield Co., Kingston, N. Y., organized 75 years ago as a stove and plumbing establishment and which has since expanded its business to the supply field and the heating and plumbing work, announces that its activities will be devoted hereafter entirely to the jobbing field. George Canfield, who has been in charge of the mechanical department, will continue to act as advisory and consulting engineer for the benefit of the company's wholesale customers.

Unique Heating System for Automobile Repair and Service Building

A UNIQUE heating system is installed in the nine-story automobile repair and service building occupied by Don Lee, in San Francisco. The main boiler is a Kewanee locomotive-type, return-tubular unit, generating steam at 55 lbs. pressure. There is a 1,360-gal. fuel-oil tank under the sidewalk. A centrifugal oil pump, direct-connected to a 3-h.p. electric motor, pumps the fuel oil to the Fess oil burners at a pressure of 30 lbs.

Steam is carried to the eighth floor at a pressure of 55 lbs. and is there reduced to 25 lbs. for supplying heated air to three motor-driven blowers for the dry room of the paint shop. There are 260 ft. of 2-in. radiators for heating the air for the blowers. Steam is also used in a system of coils for removing paint from cars. All condensation returns to the boiler room. A single-cylinder pump delivers the return water back into the boiler.

A Kewanee refuse burner operated in connection with a 500-gal. hot water tank supplies all the hot water used throughout the building. The refuse which accumulates on the various floors of the building is all the fuel that is required to provide sufficient hot water for all purposes. The water tank is connected to the main boiler so that steam from it can be used for heating the water, if necessary.

A saving of about $400 per year in the total fuel bill is made by burning oil, gasoline and distillate conserved from the various departments of the plant such as machine shop, and repair department. A tank is provided into which are emptied all engine crank case oil, all lubricating oil, and all gasoline and distillate used in cleaning parts. The various kinds of oils pass through a series of strainers arranged in the top of the tank. In the bottom of the tank there is a 2-in. pipe which leads to the 35-barrel fuel-oil storage tank located under the boiler room. This oil is mixed with the regular fuel-oil in the storage tank and used in firing the boiler.

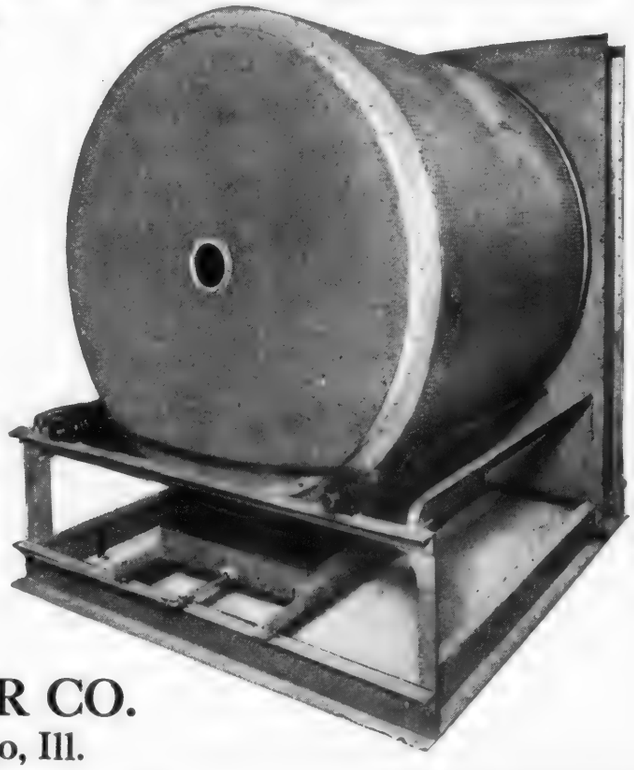
A "SYSTEM" of Air Filtration Instead of "Justa Filter"

The modern Power Plant Engineer wants *automatic* air filtration, just as he wants everything else about his plant automatic.

"Justa Filter" leaves most of the work of air cleaning for the Engineer to do. The "National Rotary" does everything "Justa Filter" will do; then does the Engineer's work as well.

In other words

It Cleans The Air—Then Cleans Itself.



NATIONAL AIR FILTER CO.
9 South Clinton Street, Chicago, Ill.

Within easy Delivery Distance! *Everywhere!*

When you want ventilating equipment, you want it quick.

That's why complete stocks of American Blower ventilating apparatus are carried by the leading electrical jobbers in all principal cities.

Electrical and ventilating contractors everywhere handle and install American Blower fans and blowers for stores, offices, shops, factories, garages, homes and countless other installations.

Proper ventilation pays and pays well—you can't afford to be without it any longer.

Your local contractor will gladly quote you on installing American Blower Ventilating equipment. The cost is surprisingly low.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.

529

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

C. A. Dunham Company's New Building

As announced last month, the C. A. Dunham Co., Chicago, Ill., has taken possession of the new Dunham Building at 450 East Ohio Street, where its administrative and general offices are now located. The new building supplements the $100,000 addition to the Dunham factory in Marshalltown, Ia., completing a program mapped out five years ago, when the general offices of the company were moved from Marshalltown to Chicago.

The new Dunham building is a 9-story structure near Chicago's outer Lake Shore Drive on Ohio Street on the near North Side. The architects are D. H. Burnham & Co. Bedford stone is used up to the third story. From that point, dark-red faced brick is used for five stories. The top story and attic are faced with buff terra cotta to match the Bedford stone. The company's offices are located on the three top floors.

A battery of low-pressure, oil-fired steam boilers supplies heat to the building, which is equipped with a Dunham vacuum heating system.

In addition to the C. A. Dunham Company, the affiliated companies, including the Young Pump Company, Dunhameter Corporation, the Walter H. Prier Company, and the Dunham Building Corporation have offices in the same building.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

"Readers Announcement"

Our Educational Service is being extended to readers of THE HEATING AND VENTILATING MAGAZINE. It is for Manufacturing and Contracting folks, as Employers, Draftsmen, Salesmen, Mechanics, Clerks, Apprentices, etc.

Since 1910 the St. Louis Technical Institute has taught quite an army of folks desiring to improve their opportunities. Our courses are Modern, Comprehensive and Official, and designed to give you those higher, finer touches your profession requires.

We Teach You In Your Own Home, Personal, Clear, Direct.

Our School Directory sent Free to interested parties. Indicate your Course when writing.

HEATING VENTILATING ENGINEERING
SPECIAL STEAM AND WATER HEATING
PLUMBING DESIGN AND INSTALLATION
WARM AIR HEATING
CONTRACTING AND ESTIMATING
MECHANICAL DRAFTING

Start with the 1925-26 School Season

ST. LOUIS TECHNICAL INSTITUTE
4541 Clayton Ave., St. Louis, Missouri

SALES ENGINEERS WANTED—Preferably with heating and ventilating experience, to sell our complete line of heating and ventilating units for schools, churches, factories, garages, etc. Commission basis with drawing account. Need men immediately to cover States of Wisconsin, Minnesota, Iowa, Nebraska, North Dakota, South Dakota, Kansas and Oklahoma. Address, The Buckeye Blower Co., Columbus, Ohio.

POSITION WANTED—Erecting or shop superintendent and engineer. Specializing in heating and ventilating, power and pipe bending. Familiar with use of transit. Capable of designing and estimating if required. Competent, able, efficient. 25 years' practical experience. Would prefer to affiliate with A-1 engineering and contracting organization, operating on heavy installations, eastern district. Box 61, care of Heating and Ventilating Magazine.

HELP WANTED—Ventilating draftsman, thoroughly experienced; age 25 to 30 years; prefer technical education; require at least two years (preferably more) all-around drafting experience on heating and ventilating work. Good opportunity with large industrial concern in the east. Address Box 62, care of Heating and Ventilating Magazine.

SALESMAN WANTED—Experienced boiler and radiator salesman for Philadelphia and vicinity. Give age, experience and references in first letter. Address Box 63, care of Heating and Ventilating Magazine.

MANUFACTURERS' AGENTS WANTED—Manufacturers' agents wanted throughout the United States who know steam and hot water specialties, to take on a complete line of well-known indirect water heaters, steam hot-water generators, gas water heaters, water relief valves, etc. Address M. A., 39 Sudbury St., Boston, Mass.

SPRACO AIR FILTERS

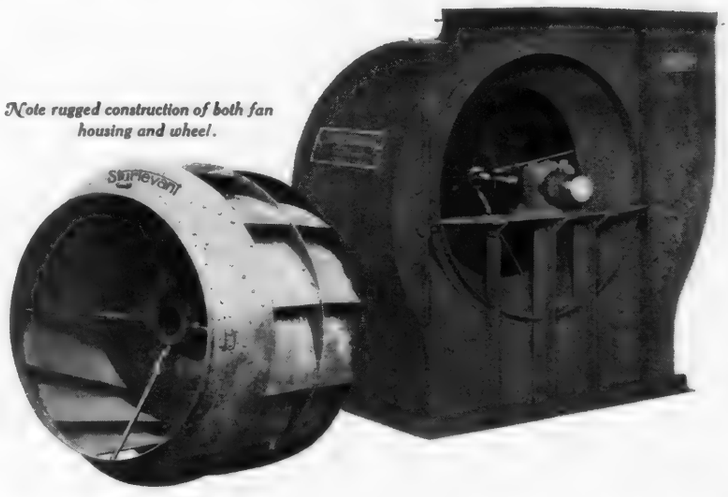
Embody the highest standard of construction throughout. Installation cost is exceedingly low due to sectional framework. All parts made of heavy gauge metal assuring maximum life commensurate with reasonable first cost. The four quick acting spring latches which exert a total pull of 80 lbs. on the cell hold it tightly against the two point seal, eliminating any possibility of air leakage between framework and cells.

For further details send for Bulletin F-81

SPRAY ENGINEERING COMPANY
Boston, Mass.

Sturtevant Silentvane

Cuts Operating Costs 25-30%



Note rugged construction of both fan housing and wheel.

The Silentvane's high efficiency cuts operating costs 25% to 30%. Its self-limiting horse power characteristic prevents motor overload and permits the use of a motor smaller than would be required for other types of fans. Hence, a considerable saving in first cost of motors. The Silentvane gives more dollar for dollar value than any other ventilating fan. It is built of the finest materials to give economical and dependable service. Its life is equivalent to the life of the building. Quiet operation and extraordinary freedom from trouble have popularized the Sturtevant Silentvane with architects and engineers. In construction, operation, and service the Silentvane is without a peer. Nothing has been left undone to make it the finest ventilating fan on the market—it's a quality product throughout.

Send for our Silentvane Bulletin No. 290

B. F. Sturtevant Company

Hyde Park, Boston, Massachusetts

Plants located at

Hyde Park, Mass. **Berkeley, Cal.** **Camden, N. J.**
Sturtevant, Wis. **Framingham, Mass.** **Galt, Ontario**

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St. Louis, Mo.
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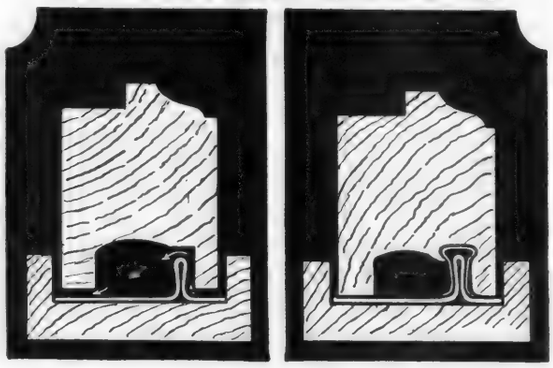
Seattle, Wash.
Toronto, Ont.
Washington, D. C.

Foreign Representatives

American Trading Co. Tokio
American Trading Co. Shanghai
Catton Neill Eng. & Mach. Co. Manila
H. P. Gregory Co., Ltd. Sydney
Honolulu Iron Works Co., Honolulu, T. H.
Blair, Reed & Co., Ltd. Wellington
Wesselhoeft and Poor Caracas
Wesselhoeft and Poor Bogota
General Machinery Co. Tampico
Pedro Maritino, Inc. Lima
Compania Italio-Americana de Importacion Buenos Aires
A. E. Barker Johannesburg

1565

HIGGIN
ALL METAL
WEATHER STRIPS



Ordinary single-member strip Sash grooved for cord

The exclusive Higgin Insert Strip completes the job

Are you recommending the right weather strips?

The only weatherstrips made with a self-holding spring-flange **Insert** are Higgin All-Metal Weatherstrips.

No window without this **Insert** can be as draft-tight as a Higgin-equipped window. The illustration shows why.

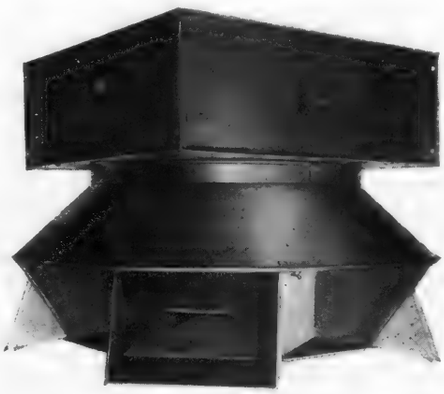
The spring flanges of the **Insert** lightly grip the sides of the raised rib and close the space around the sash at every point.

There is no air leakage where the sash is cut out for the cord, nor seepage around the rib when the sash shrinks. The metal-to-metal contact insures a perfect fit and closure; also an easy-sliding sash under all conditions.

A Higgin Installation means added comfort, greater fuel saving, increased satisfaction with the heating system.

HEATING ENGINEERS! You can safely guarantee a definite heating efficiency for your equipment when Higgin All Metal Weatherstrips are installed. They keep all the cold air out and all the warm air in. They never lose their close fit by warping or shrinkage of frames. Every job is installed by trained Higgin men and guaranteed by the Higgin organization. Recommend Higgin All-Metal Weatherstrips to your customers.

The HIGGIN Mfg. Co.
Newport, Ky.
Toronto, Canada.
Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens



Good Engineering is 98% Common Sense!

You may balk at the percentage but recognize the principle.

Wing Featherweight Unit Heaters follow this principle. It is good judgment to locate Unit Heaters overhead, because of the profit paying advantages that result from this location. A floor clear for production—unobstructed light—low installation cost due to the elimination of pipe trenches and sub-grade boiler rooms, with an actual reduction in the amount of steam needed to heat the building, by preventing an accumulation of overheated air in the upper spaces.

It is common sense to deliver the heat to the level you are most interested in heating—that is the floor or working level.

That's reasonable, isn't it?

L.J. Wing Mfg. Co.

Fans and Exhausters *Forced Draft Blowers*
Small Turbines *Damper Regulators*
Hudson & 13th St. New York City

These buildings are "Buffalo"-Carrier equipped

The Union Trust Building, Cleveland Public Auditorium and the new plant of P. A. Geier Co., all of Cleveland, are Buffalo-Carrier equipped.

Mr. A. Cook, Engineer, the Union Trust Company, says: "Buffalo Forge equipment...has fulfilled our requirements in every way. In addition it has the further advantage of being extremely quiet in operation—a feature especially desirable in an office building."

Mr. H. M. Warner, Engineer, Cleveland Public Auditorium, says: "Buffalo Forge equipment... has performed perfectly, smoothly and quietly, with no repairs and very little maintenance."

Mr. C. A. Lawrence, General Supt., P. A. Geier Co., says: "From the standpoint of efficient and economical heating, our Buffalo Forge fans are decidedly a paying investment."

Apparently, Engineers, as well as a goodly number of Architects, are thoroly sold on the merits of Buffalo-Carrier heating and ventilating equipment.

Catalogs on request.

INTERIOR OF THE CLEVELAND PUBLIC AUDITORIUM DURING THE LAST REPUBLICAN NATIONAL CONVENTION.

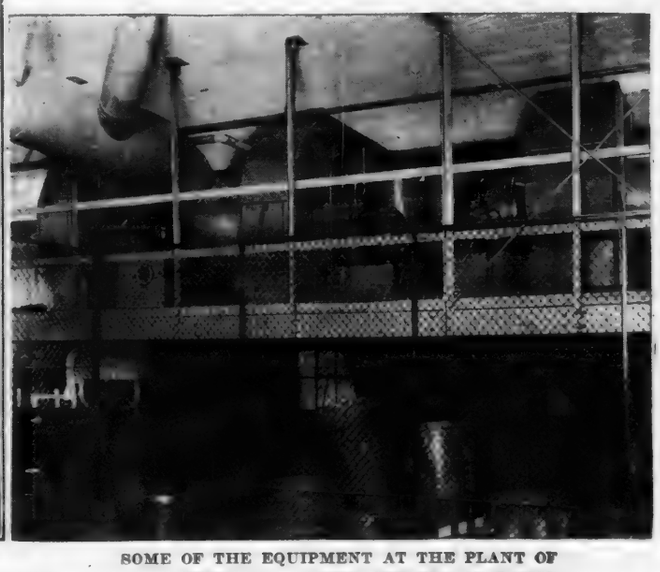
BUFFALO FORGE COMPANY

Carrier Air Conditioning Co. of America

480 Broadway Buffalo, N. Y.

In Canada—Canadian Blower & Forge Company, Ltd. Kitchener, Ont.

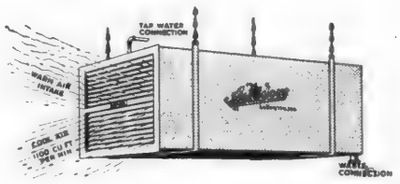
THE UNION TRUST BUILDING, CLEVELAND. SAID TO BE SECOND LARGEST OFFICE BUILDING IN THE WORLD.



SOME OF THE EQUIPMENT AT THE PLANT OF P. A. GEIER CO., MANUFACTURERS OF ROYAL VACUUM CLEANERS.

COOL!

The Aerodore
GAMES SLAYTER SYSTEM



The Aerodore cools, washes out dust, and odors, controls humidity.

Any home, office or kitchen can be kept below 80° in the hottest weather.

Simple in construction, operated entirely by city water, no electrical or other connections necessary.

Write today for descriptive folder.

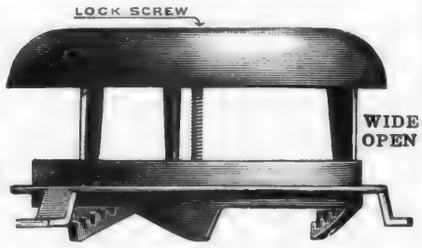
Announcing "Slayter Unit Heat"

A combined Oil Burner, Warm Air Furnace, Unit, which has been under development for five years. (Inquiries solicited.)

Games Slayter
Industries

Lafayette Ind.

History
Built
Confidence



Nu-Notch Mushroom
REG. U.S. PAT. OFF.

The Engineers and Architects' confidence in Knowles Mushroom Ventilators has been built during the many years of successful operation of these ventilators.

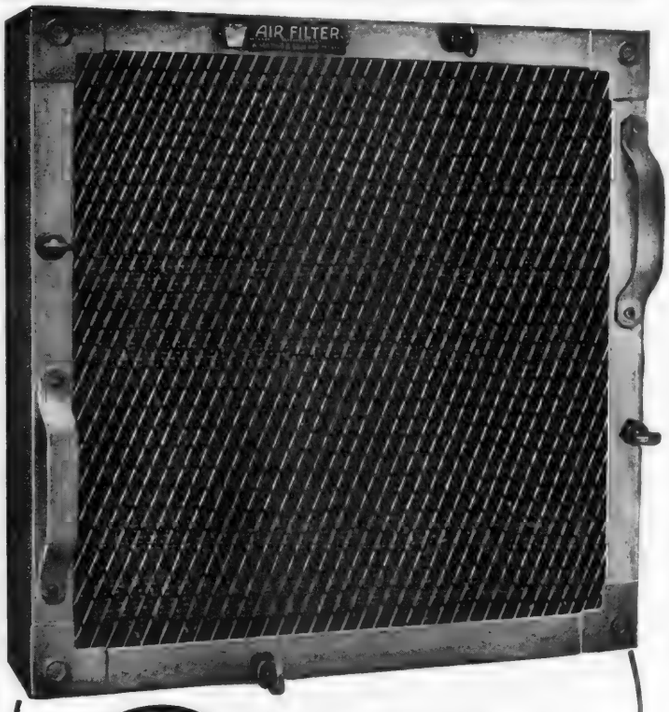
And now, a new and improved mushroom, The NU-NOTCH, has been developed by this manufacturer, which has already gained prominence among the Engineers and Architects in the ventilating industry, being widely specified by these men for theatre and auditorium ventilating purposes.

The NU-NOTCH is easily adjusted to many regulations, from wide open to completely closed. After the adjustment is made, no loosening can be effected accidentally,—the lock-screw holding it rigidly in place in recessed notches.

In the NU-NOTCH it will be noted there is practically no obstruction to the passage of air.

Let us send full details

Knowles Mushroom Ventilator Co.
202-204 Franklin St. NEW YORK CITY



DURO COPPER MEDIA
TRADE DURO MARK
ALL METAL AIR FILTER Co
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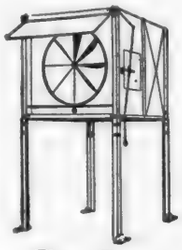
More than 750 Nationally Known Concerns Have Adopted ILG Unit Heaters

8,000 Units in Operation



Floor Type
Ilg Unit Heater
without diffuser

THE ILG Unit Heater represents a new engineering principle in blast heating, whereby the air is heated at low velocity and discharged a distance of 50 to 60 feet at high velocity. Because of its pronounced efficiency, economical installation, low power consumption and flexibility it has won wide spread recognition. It is the only Unit Heater made with an adjustable deflector which controls the placement of the heat waves at their source. Of the more than 800 units in operation, one-third are repeat orders. Write for new illustrated Bulletin of special interest to Architects, Engineers and Contractors. Sign and mail the coupon.

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with diffuser

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Please send me a copy of your new Illustrated Bulletin, featuring the ILG Unit heater and showing numerous photographic views of interesting installations.

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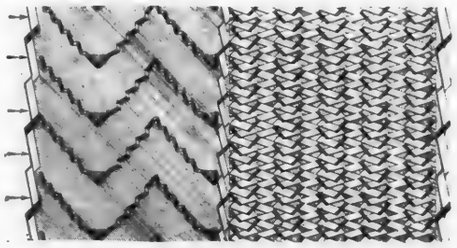
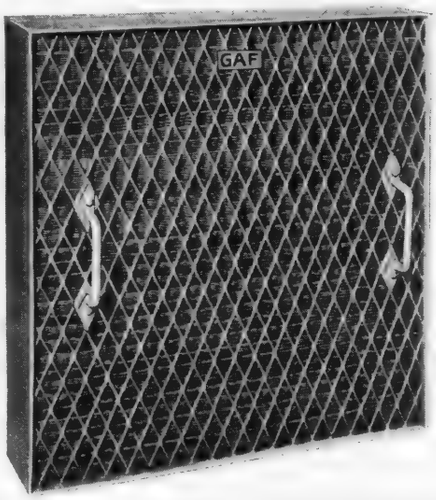
THE FIRST STAGE of the General Air Filter takes out all the coarse dust and the heavier fines which constitute seven-eighths of the total dust. It does this by catching them on a series of continuous, overlapping baffles, the slotted surfaces of which are always moist and sticky with a special non-evaporating oil. The troughs of the baffles form oil retaining reservoirs that positively prevent drying out.



THE SECOND STAGE of the General Air Filter removes the remaining very fine dust particles by catching them on the sticky oil coated surfaces of a special densely packed expanded metal. As all the coarse dirt or lint particles are caught in the first stage, this media cannot become clogged. This insures a maintained low average resistance for long periods and permits thorough cleaning.

GENERAL AIR FILTERS



will give you Pure Air

Scientific tests in a special laboratory equipped with the "A-A" Dust Determinator, developed by the U. S. Bureau of Mines, have conclusively proved the very high cleaning efficiency of the General Air Filter.

The light-weight, welded filter units fit snugly into a substantial steel frame against a wool felt gasket that makes a tight joint. They are easily handled—easy to clean—and easy to restore to their high initial efficiency.

Their low average resistance means a saving in power.

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FIXED TOP

MUSHROOMS
CAST IRON

Intended for DeLuxe Theaters where expense is a secondary consideration.

Looks the Same—Much Simpler to Install

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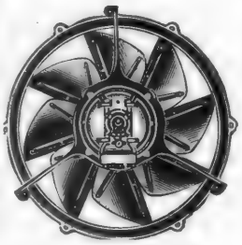
Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.



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FOR the sake of installation economy as well as heating advantage, the Modine Unit Heater merits your thoughtful consideration. It simply suspends from the overhead steam or hot water supply line, at any discharge level desired, by means of a length of pipe and a union. No brackets, braces or structural supports required. Occupies less than 4½ cubic feet of space. Instead of handling and supporting *tons* of dead weight you work with *pounds*—for each Modine Unit weighs only 125 lbs., yet equals the heating capacity of 700 square feet of direct radiation. Delivers 2000 cubic feet of heated air per minute *in any direction desired.* At 60° room temperature, the B. T. U. discharge is 165,000 per hour. Easily installed in 30 minutes—which often means days saved on a heating system installation.

Write for Bulletin "A" which has all the facts.

MODINE MANUFACTURING COMPANY
Heating Division ThermModine *Racine, Wisconsin*

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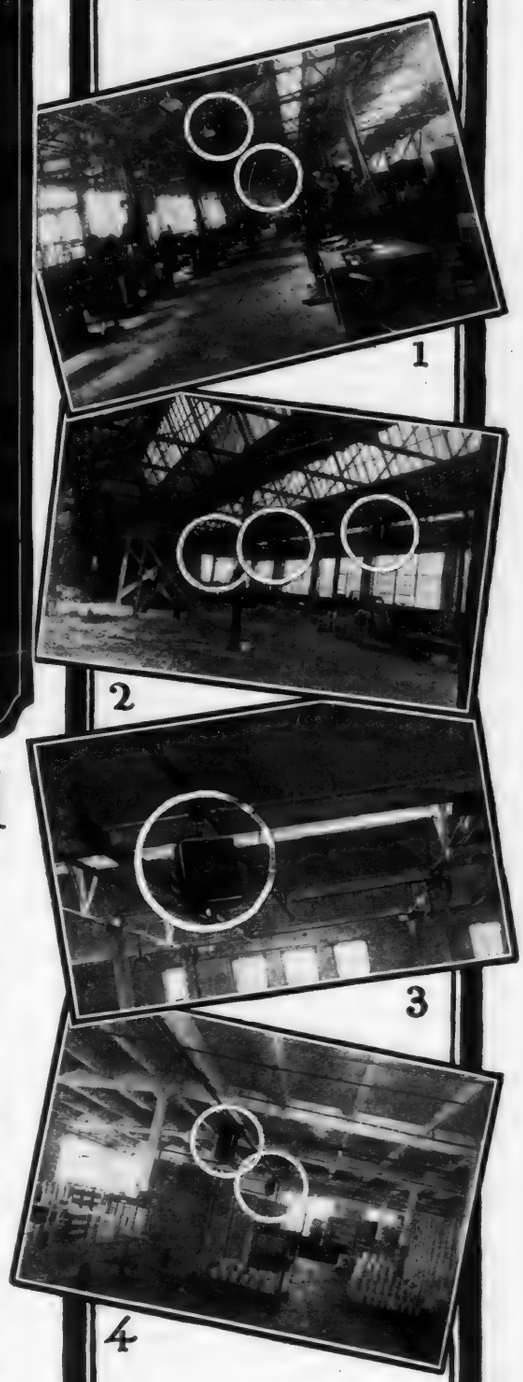
UNIT HEATER
for Steam or Hot Water Heating Systems

Typical Modine Unit Heater Installations:



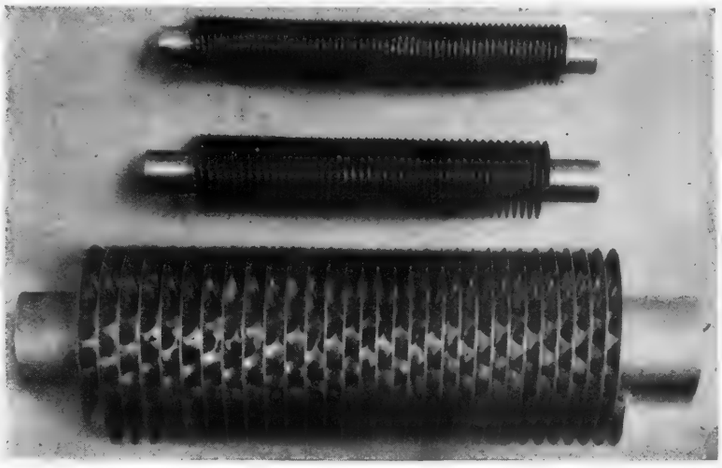
1 —Factory; 9,000 square feet; 4 Modine Units.

2 —Machine Shop; 10,000 sq. feet; 5 Modine Units.

3 —Public Garage; 11,000 sq. feet; 3 Modine Units.

4 —Varnish Packing Room; 6,000 square feet; 2 Modine Units.

6 to 10 times as much surface as plain tubes of same size



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3 sizes—1½", 2" & 3"—all lengths—plain ends or flanged—with or without headers.

The radial fins insure maximum heat transfer

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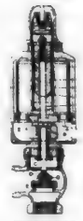

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Whether it be for an isolated room or complete building, Gold's Control will give you that desired equable temperature. Energy derived from the 110 volt lighting current.

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For Heating Factories, Garages, Etc.

More and more heating engineers are recommending heating UNITS in place of ordinary steam radiation. The first cost is lower, installation is easier, and the heating units effect a big saving of floor, ceiling and wall space. Operation is no more expensive and far more satisfactory. The unit system distributes the heat more evenly throughout the room and heats the room much quicker than ordinary radiation, yet the units cause no extra drain on the boiler. No more B. t. u. are required; no more coal; no extra expense. The room can be heated quickly by starting the unit motors or cooled quickly by stopping them. There is no waste of heat when not needed.

Peerless Industrial Heating Units are made in the same plant which builds the well-known PeerVent Unit System of Heating and Ventilating. Heating and ventilating units built by this company twelve years ago are still giving trouble-free service.

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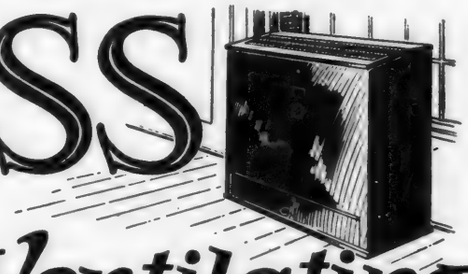

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Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

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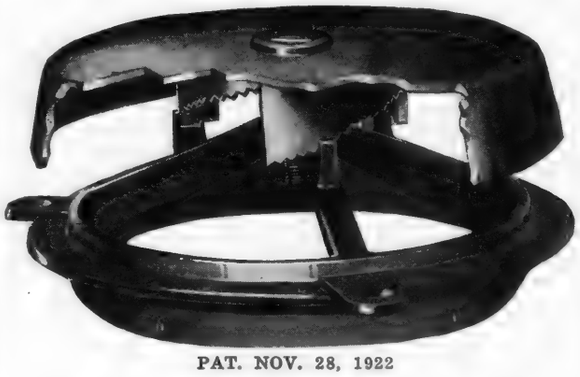

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Cast Iron Throughout. Simple to Install. Made in 6″, 8″ and 10″ Dia., and 8″ x 12″ Oval.

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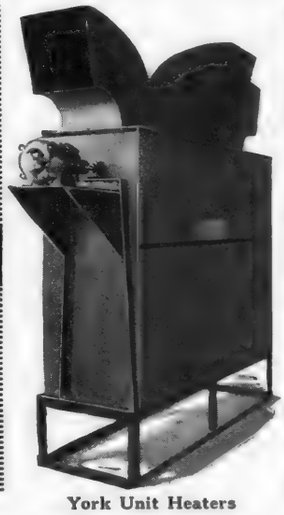

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We Can Prove the Advantages of Floor Mounting for Unit Heaters

York builds both Floor Mounting and Overhead Suspension Unit Heaters. We have recently conducted smoke bomb tests under operating conditions, and now *know* exactly how warm air circulates. Since we build both types we were naturally unprejudiced in making the tests.

Our Bulletin C-25 illustrates and describes the actual results of these Smoke Bomb Tests. Write for it,—no obligation.

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The coming vacation period provides an ideal opportunity of replacing your old heating system with the new, modern, economical and health promoting Heatovent System. The Heatovent is very flexible, easy to install, simple to operate, and requires very little floor space. Old buildings in which no means of ventilation have been provided, can be readily and easily equipped with the Heatovent System.

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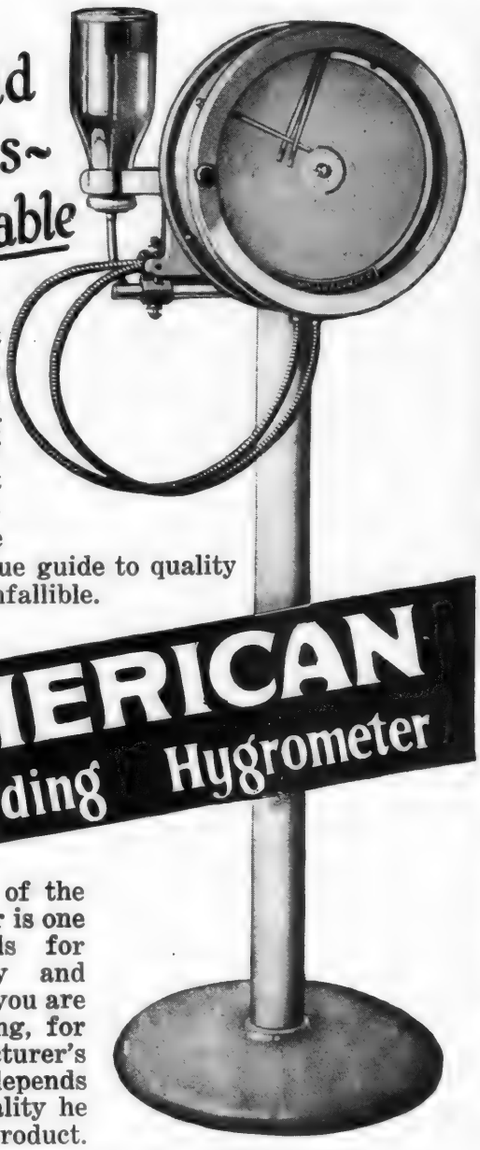

You cannot judge the accuracy and long-wearing qualities of an instrument by its appearance. There is just one true guide to quality —and it is infallible.

AMERICAN Recording Hygrometer

If the name of the manufacturer is one which stands for high quality and fair dealing, you are safe in buying, for the manufacturer's reputation depends upon the quality he puts in his product.

The name "American Schaeffer & Budenberg Corp." has never been put on any product that is not of the highest quality. For more than three-quarters of a century this firm name has meant *guaranteed* satisfaction.

You can place the utmost confidence in any product manufactured by this concern, whether it is a Thermometer, Recording Thermometer, Gauge, Gauge Tester, Temperature Controller, Hygrometer, Steam Trap, Tachometer, or a Pop-Safety or Relief Valve.

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These instruments give a written record of the percentage of humidity and moisture every minute of the day and night.

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RADIATOR HANGER

TRUST the women to spread the news! Every time you hang radiators the E-Z way you've made some woman a friend for life! And she'll tell all her friends how this vast improvement saves her back on cleaning day!

The E-Z way makes less work for you too.

No accurate placing of anchor bolt required— it is adjustable.

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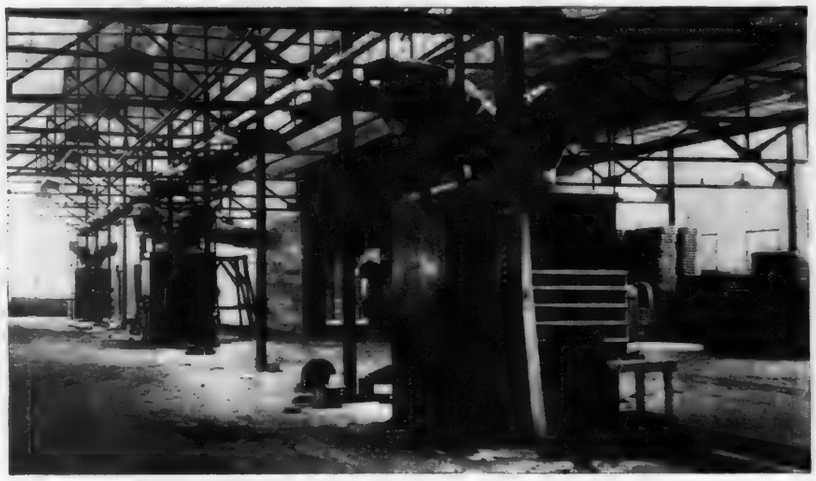


Pecco Unit Heater Installation, Metropolis Bending Co., Metropolis, Ill. This plant is also equipped with 2 Pecco Blower Systems designed to pump 50,000 cu. ft. of air per minute out of the building.

Complete Heating Satisfaction

The complete, unvarying success of the Pecco Unit Heater in practically every field of industry is due to the fact that it follows the natural, fundamental laws of aero-dynamics—instead of going contrary to them.

The 2-way cold air intake in a Pecco Unit Heater is located where it belongs—near the floor, at the natural cold-air level.

The warm-air outlets are located at points where warm air can be most efficiently projected—at or near the natural warm-air level.

This design provides the most complete re-circulation of all air in a building. The cold air is quickly exhausted and is rapidly replaced by warmed air—which, because of the constant fan pressure, is evenly distributed to the most remote corners of the open building space. Air circulation is not confined to the air immediately under the building roof.

Because of the unusual efficiency of the special Pecco fan wheel, greater operating economy results and the heater needs to be operated only several hours daily to obtain desired results.

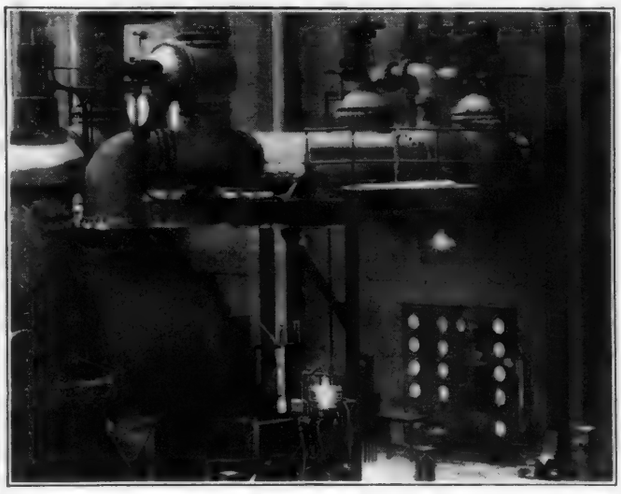
Can be furnished in either direct-connected or belt-driven type.

In addition to floor type unit heaters, Pecco, Inc., also builds the so-called "copper fin" ceiling-suspension heater, which is recommended only where it is desirable to warm merely the air at and near the ceiling and where efficient over-all re-circulation is not essential.

PECCO, INCORPORATED, 2980 North Market Street, St. Louis, Mo.

PECCO UNIT HEATERS

"They Keep The Whole Place Warm"



So Much Smoke—There Must Be Fire

Ask to see the gauge boards of any of the three great stations of the Detroit Edison Co., or the Kearney Station, Public Service Co., N. J., or the Toronto Station, Ohio Edison Co., or the Crawford Ave. Station, Commonwealth Edison Co., Chicago; or the Long Beach Station, California Edison Co., or the Edgar Station, Boston Edison Co.; or the Philo Station of the Ohio Power Co., illustrated above.

You'll find all of these plants and many more equipped with Foxboro indicating, recording and controlling instruments.

Here are the most efficient power producing plants in the world. The engineers in charge reduce the production of power to a science. Scientific control is made possible by information supplied by these instruments. You may be sure that this responsibility is not intrusted to instruments that are not accurate, dependable and reliable.

In the face of these facts there must be some justification for Foxboro's claim for superiority.

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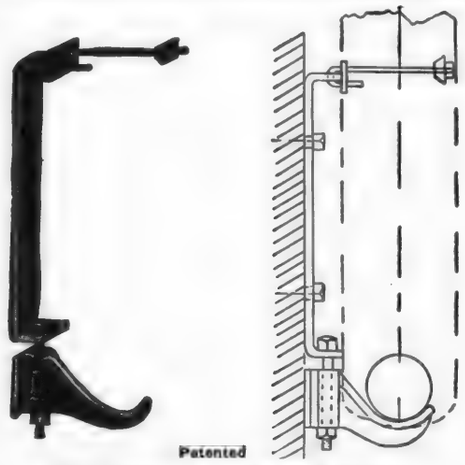

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All That A Radiator Bracket Should Be

Gleockle Radiator Brackets are designed and constructed by men who are thoroughly familiar with radiator bracket requirements. They are all that a radiator bracket should be. They are safe, convenient, durable, adjustable, easy to erect, inexpensive, invisible after erection and will fit any make of wall radiator.

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FIT ANY MAKE OF RADIATOR

A. F. GLEOCKLE, Jr.

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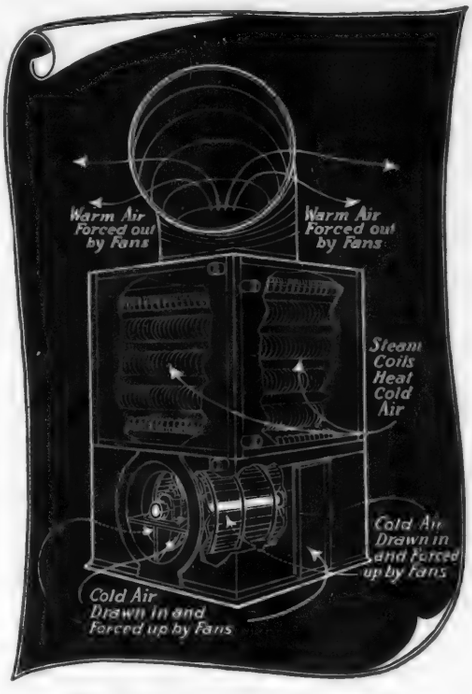
The Latest Model of the Pioneer Unit Heater Retains Leadership through its exclusive features

No other heating device has this Two-Fan Four-Inlet Design

Greater efficiency through the reduction of fan surface to circulate an identical quantity of air.

Increased circulation and ventilation through the handling of air from four directions instead of two, as formerly.

A more compact unit through a reduction in size — an advantage of very definite worth in the modern industrial building.


Warm Air Forced out by Fans
Warm Air Forced out by Fans
Steam Coils Heat Cold Air
Cold Air Drawn in and Forced up by Fans
Cold Air Drawn in and Forced up by Fans

The New Improved Skinner Bros. Two-Fan Four-Inlet Steam Coil Heater

A far greater versatility to meet every requirement of the modern industrial building than any other heating device.

Decreased air velocity at inlets, which overcomes every possible objection to perceptible drafts other types of heaters have been unable to eliminate.

Minimum power consumption through improvements in fan construction.

No heating device on the market can be compared with the new Improved Two-Fan Four-Inlet Skinner Bros. Steam Coil Heater in its efficiency and effectiveness, because the two-fan four-inlet feature is exclusively a Skinner Bros. development. SKINNER BROS. STEAM COIL HEATERS NOW TAKE AIR FROM FOUR DIRECTIONS. No cold corners, no frigid spots in the factory can withstand the positive action of these heaters. Skinner Bros. Two-Fan Four-Inlet Heaters are built by the original manufacturers of ductless heating systems. They are produced under the supervision of heating and ventilating engineers of long, uninterrupted experience, and include all the improvements of the original patentee. Their performance is guaranteed when they are installed as directed by Skinner Bros. Engineers.

There is a Skinner Bros. Direct Fired Heater for use where steam is not available. Illustrated literature on request.

SKINNER BROS. MFG. CO., Inc.

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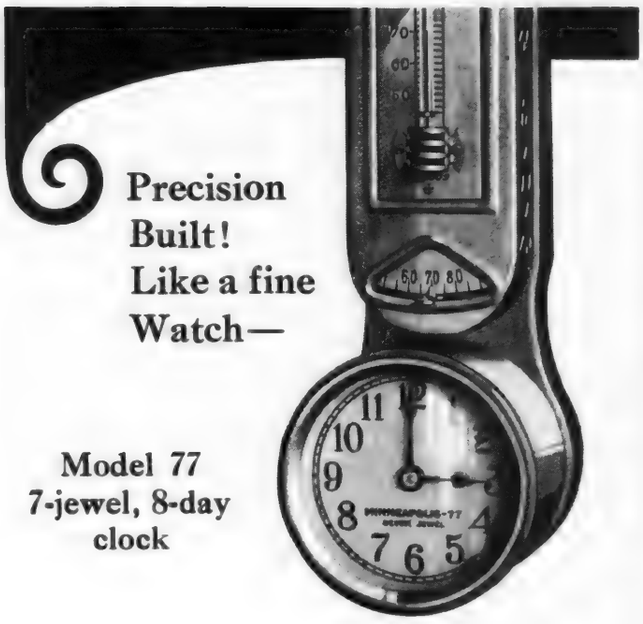


Precision Built! Like a fine Watch—

Model 77
7-jewel, 8-day clock

The "MINNEAPOLIS" HEAT REGULATOR
for COAL–GAS–OIL

This dependable 7-jewel, 8-day clock has been one of the important factors in making the Minneapolis Model 77 Thermostat the supreme automatic heat control equipment, beyond all competition.

The Minneapolis Clock is built right throughout—7 jewel movement, Breguet hair spring, compensating balance, heavier plates, highly polished pinions and pivots, every essential bearing jeweled—many other outstanding construction features — finished like a high grade watch. Manufactured complete in our model clock factory where every step is directly under our control.

The simplified Model 77 Thermostat and the Minneapolis-made clock have no equal.

Write today for complete information

MINNEAPOLIS HEAT REGULATOR CO.
Established 1885
2804 Fourth Ave. So., Minneapolis, Minn.

HARTMANN
RADIATOR BRACKETS

The radiator hangers used in the construction of a building furnish a good guide in determining the quality of the job. Hartmann Brackets are always to be found in a high-class installation because Architects, Engineers and Contractors have experienced that Hartmann Radiator Brackets are accurately and strongly made, are economical and always dependable.

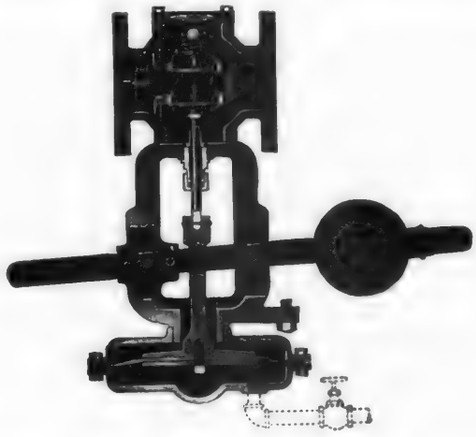
THREE STYLES

AR NR NV

Write for descriptive circular and price list

Charles Hartmann Co.
975-993 Dean Street - Brooklyn, N. Y.

Quality KIELEY Simplicity
REGISTERED TRADE MARK



Engineers have specified Kieley Specialties for the Largest Buildings and Power Plants in the United States. Manufacturing Specialties for 47 years warrants that confidence.

KIELEY & MUELLER, Inc.
34 West 13th St., New York City

Universal Heating & Ventilating Unit

Quiet-Operating Single-Phase Alternating Current Motors Are Now Available in the *Universal Heating & Ventilating Unit*

As a result of the development of a quiet-operating single-phase motor in combination with the three-point lead mounting feature of the *Universal* Heating and Ventilating Unit we can now supply quiet-operating motors wound for any character of current. The use of a motor-generator set is no longer necessary.

This big step forward is fully described in our new publication No. 207, which will be furnished direct or through the nearest American Blower office.

John J. Nesbitt, Inc.

213 N. Vermont Ave.
ATLANTIC CITY, NEW JERSEY

405 Lexington Ave.
New York City

Honeywell 15 day thermostat eqipped with dependable jeweled-balance movement clock and high grade thermometer.

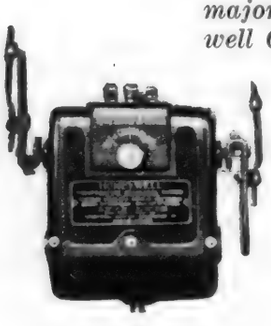
Your Guarantee of a Satisfied Customer

Every householder will appreciate the certainty of positive, automatic control that is the supreme attribute of the complete HONEYWELL High-Low System.

It is not simply that HONEYWELL will, for example, automatically lower the temperature at bed time and automatically raise it to any desired temperature at any predetermined hour in the morning.

It is rather the absolute dependability of HONEYWELL that will most appeal to householders. For, when they realize that the new measure of efficiency, economy, convenience, comfort and safety which HONEYWELL affords them continues consistently, with unvarying accuracy, over an indefinite period, you will have won the greatest of all business assets—a group of enthusiastic, satisfied customers.

Of the important domestic oil burners listed as standard by Underwriters' Laboratories, Inc., a majority is equipped with Honeywell Controls.



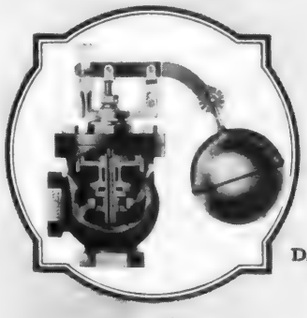
The Honeywell electric regulator motor simplified by the elimination of six parts commonly employed in motor design.

HONEYWELL

Temperature Regulators

THE HONEYWELL HEATING SPECIALTIES CO.
WABASH, IND.

VALVE MAKERS FOR OVER FIFTY YEARS



Davis Float Valve

Simplicity

... to end tinkering with valves

THE Davis Float Valve is simple, built to serve for a long time without extra attention or expense. This valve has no leather cup packing. The inner valve cannot stick. It will not permit leakage from the top. It closes tight. The inner valve has a hollow post, and is operated solely by pressure. The stem is directly connected to the float by a lever and forms an auxiliary valve that seats in the hollow post. These features mean trouble-free service.

DAVIS VALVE SPECIALTIES

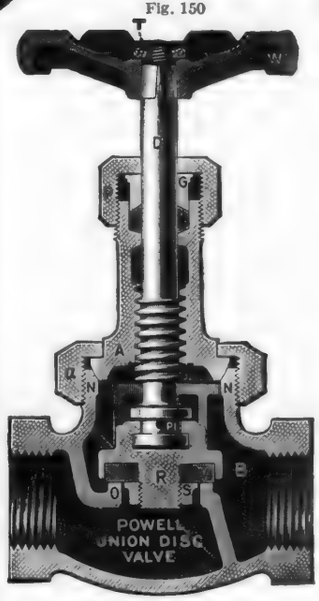
STEAM SAVERS SINCE 1875

G. M. DAVIS REGULATOR CO., 422 Milwaukee Avenue, Chicago, Ill.

H & V 6—Gray

POWELL VALVES

Fig. 150



Sizes ⅛ to 3 inches

UNION COMPOSITE DISC VALVES

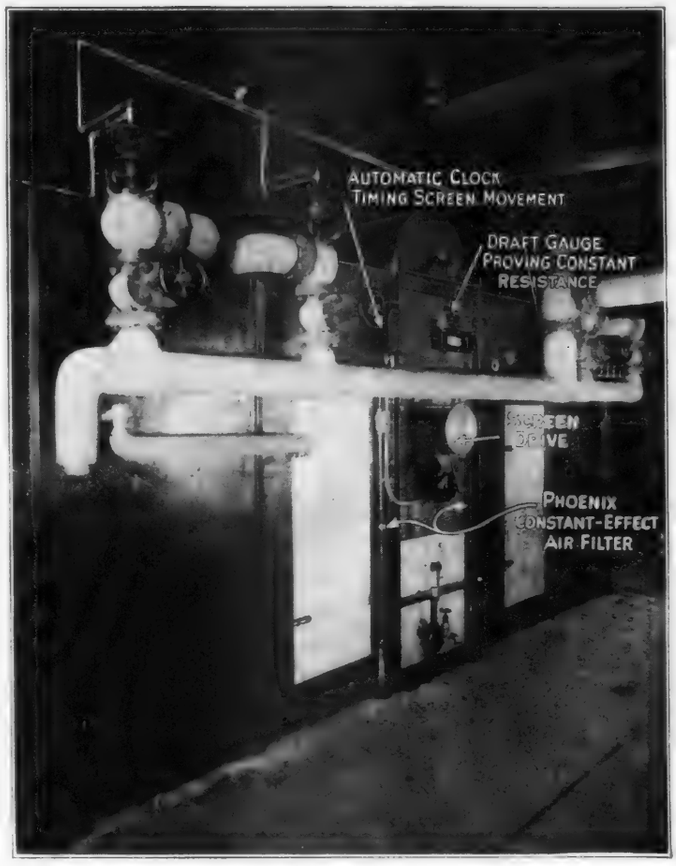
ALWAYS DEPENDABLE

For Hot Water or Steam Heating

Notice the Union Bonnet Connection

Ask your dealer for Powell Valves

The Wm. Powell Company
Cincinnati, Ohio



This Phoenix does the work in the Morrison Hotel, Chicago

ELECTRICALLY OPERATED

like the rest of the Heating, Ventilating or Air Conditioning Equipment of which it becomes a part!

The Automatic Phoenix *Constant-Effect* Air Filter

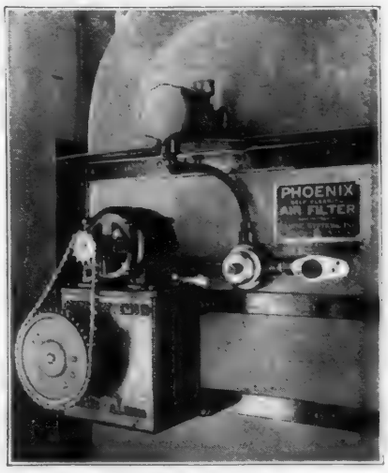
An automatic clock-switch starts the ¼-h. p. motor at 24-hour intervals, the screen is moved exactly one-sixth of its length, then the clock-switch stops the motor. Automatic, positive, insures maximum possible effectiveness and absolutely constant results.

Or, if preferred, a push-button control may be used. A designated employee snaps a switch. The motor starts and when the screen has been moved the proper distance, the automatic cut-off stops the motor. A single clock-switch or push-button panel, located at any desirable point, will operate a number of filters. Centralized control.

Eliminates the operator and the old cumbersome methods necessitated by non-automatic air filters.

Complete Descriptive and Data Bulletin on request

Automatic Clock Switch



Automatic Cut-Off

AIR FILTER DEPARTMENT

DRYING SYSTEMS, INC.

OFFICES, SHOPS AND LABORATORIES

1800 FOSTER AVENUE

CHICAGO, ILLINOIS

50 Church St. NEW YORK | 324 Rialto Building SAN FRANCISCO | 2011 Park Ave. DETROIT

Offices in Principal Cities—Consult Telephone Directory

VAPOR MOUAT HEAT

Pressure Maintained 1 to 3 ounces

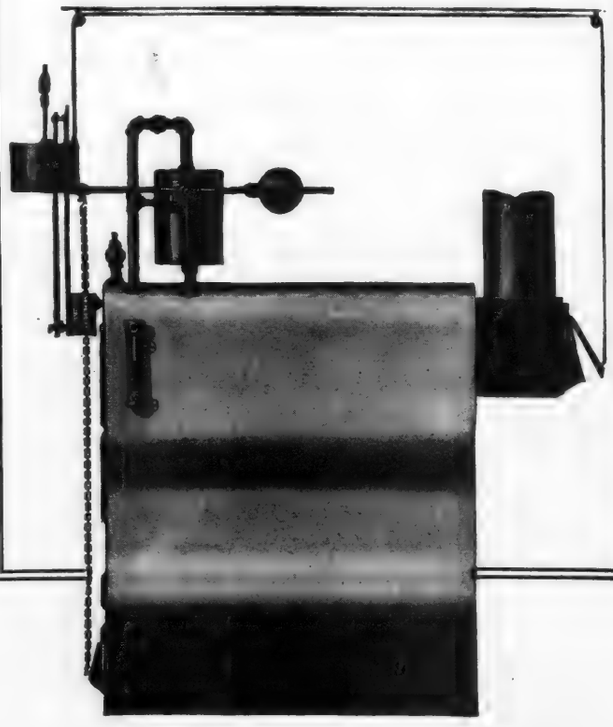
The Mouat System of Heating, a two-pipe gravity vapor or atmospheric steam heating system, operates at from 1 to 3 ounces pressure. No pumps, return traps or mechanically operated parts.

This extremely low pressure is maintained by the Mouat Damper Regulator, sufficiently sensitive to operate at a variation of less than one ounce. This regulator is not affected by high, low, or unsteady waterline, since the working parts are connected above the waterline of the boiler. No water can be forced out of the boiler through the regulator.

This regulator can also be used to reduce steam pressure to vapor pressure on central station heating plants.

The accompanying illustration shows a typical installation of a Mouat Damper Regulator.

Mouat Vapor Heating Company
CLEVELAND, OHIO



The Frank Legless Radiator Bracket

(PATENTED)

Clean Concealed Jobs—

The hanging of radiators with FRANK BRACKETS results in clean concealed jobs, with the maximum of safety and economy.

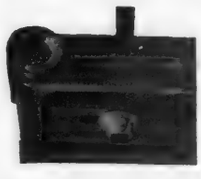
FRANK RADIATOR BRACKETS are easily installed and simply adjusted.

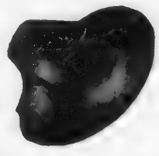
An outstanding feature of the wall brackets is the use of *only one bolt*. This means, of course, not only a cut in the cost of material, but in labor as well.

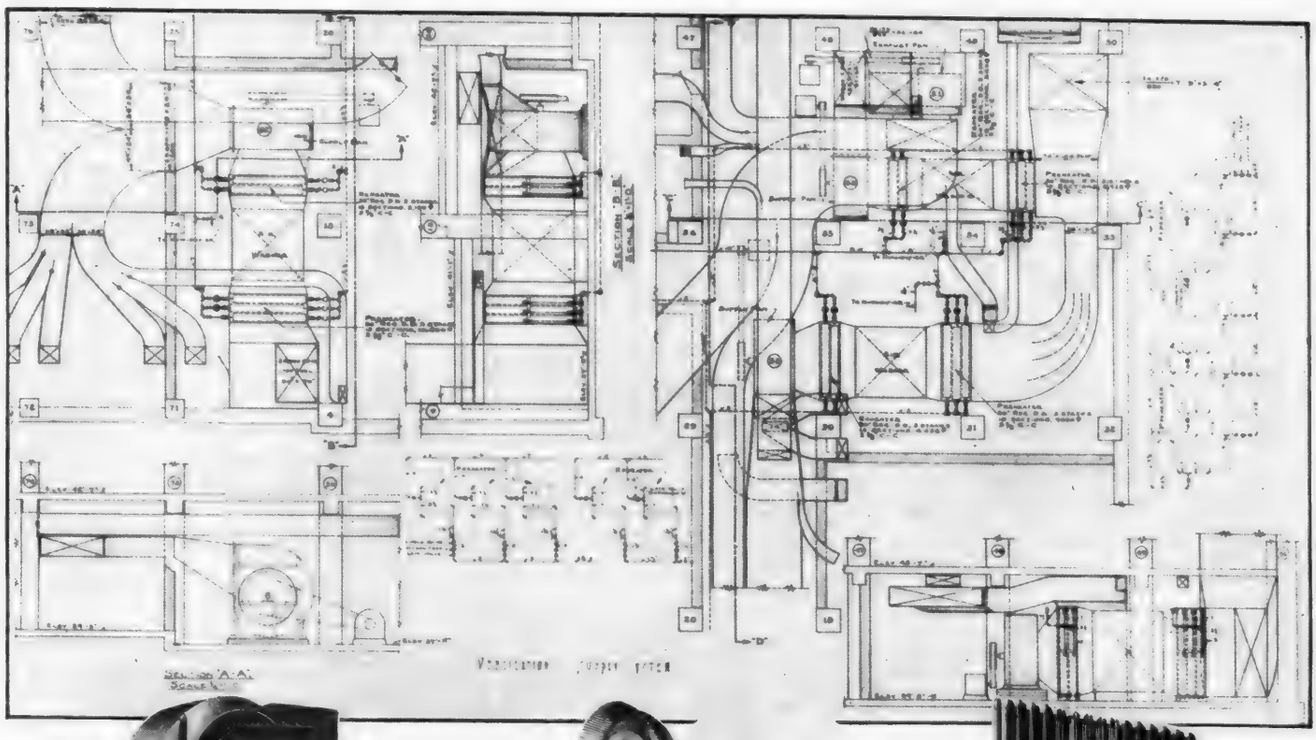
That is but one of the salient points that have made Frank Radiator Brackets known throughout the industry.

Write us for full information regarding our complete line of brackets.

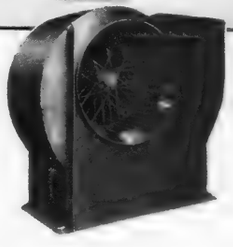
THE FRANK RADIATOR BRACKET CO.
30 No. LaSalle St., Chicago



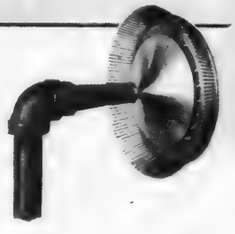




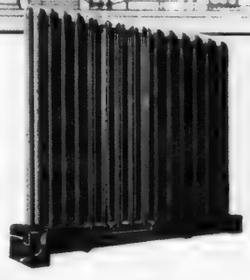
Plexiform Fan



Turbo Atomizer



Chinook Heater



Bayley Equipment Exclusively

In the New Hotel Duluth, Duluth, Minnesota, Bayley equipment was specified for the heating, ventilating and air conditioning apparatus.

The condensed diagram above, furnished through the courtesy of the architects—Martin Tullgren & Sons Company, Milwaukee, illustrates the general arrangement of the heating and ventilating supply systems.

This hotel, destined to become one of the most famous hostelries in the Middle West, is representative of Bayley installations in prominent public buildings throughout the country.

We are glad to supply catalogs and specification data on Bayley Fans, Heaters and Air Washers.

BAYLEY MANUFACTURING COMPANY
750 Greenbush Street **Milwaukee, Wis.**

Bayley

AIR ENGINEERING & EQUIPMENT
HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS—PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS

The Hotel Duluth installation comprised the following Bayley equipment:

Unit No. S1: No. 11 Plexiform Fan
No. 67 Turbo Air Washer
5 Sections No. 68 Vertical Chinook Heaters
Unit No. S2: No. 12 Plexiform Fan
No. 69 Turbo Air Washer
5 Sections No. 78 Vertical Chinook Heaters
Unit No. S3: No. 9 Plexiform Fan
No. 66 Turbo Air Washer
5 Sections No. 58 Vertical Chinook Heaters
Unit No. E1: No. 12 Plexiform Fan
Unit No. E2: No. 19 Plexiform Fan
Unit No. ET: No. 11 Plexiform Fan
Unit No. EL: No. 8 Plexiform Fan

The New Hotel Duluth, Duluth, Minnesota. Martin Tullgren & Sons Company, Architects, Milwaukee, Wis.

CORRECTION

SEVEN YEARS AGO the **UNITED STATES OZONE COMPANY** placed on the market the **FIRST SCIENTIFICALLY DESIGNED OZONIZER,** wherein **ALL FACTORS GOVERNING** the production of ozone were placed under **DEFINITE CONTROL.** These ozonizers were adapted for water purification and industrial chemical use.

THREE YEARS AGO the **UNITED STATES OZONE COMPANY** extended their designs to include Air Conditioning Ozonizers providing for the same definite control of the factors involved in the production of ozone, as there was a definite demand for apparatus of this type.

IN THE MARCH ISSUE OF THIS JOURNAL OUR ADVERTISING MAN MADE AN ERROR in stating that the Castle & Cook Building of Honolulu was equipped with U. S. Controlled Air & Water purifying equipment. This error was called to our attention by a firm of attorneys of St. Louis, Missouri, and we are pleased to correct it.

THE FACT IS that this building is equipped with **U. S. CONTROLLED OZONE WATER PURIFIER** and **AIR CONDITIONING AND ENGINEERING COMPANY'S OPEN FRAME TYPE AIR OZONATOR.**

THE UNITED STATES OZONE COMPANY HAS NEVER MANUFACTURED OR SOLD OPEN FRAME TYPE OZONATORS.

MONTGOMERY BROTHERS

Chicago	San Francisco	New York
500 No. Dearborn St.	61 Fremont St.	50 Church St.

General Sales Agents for

THE UNITED STATES OZONE COMPANY

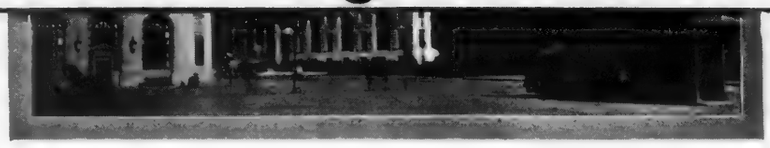
General Offices and Laboratories: 500 No. Dearborn St., Chicago.
Factory: Scottdale, Penna.

Money-Saving Uses: Reed Air

Filters can save money in practically every industry for:

General Ventilation
Electrical Ventilation
Industrial Processes
Air Compressors
Oil and Gas Engines
Drying Operations
Bacteria Control
Recovery and Control of Dusts, etc., etc.

Reed Air Filters *for Standard Oil*



Some of the Many Who Have Reordered Reed Air Filters

AMERICAN RADIATOR
AMERICAN STEEL & WIRE
CARNEGIE STEEL
E. I. duPONT de NEMOURS
FAMOUS PLAYERS—LASKY
FORD MOTOR CO.
ELI LILLY & CO.
NATIONAL BISCUIT
PACKARD MOTOR CO.
SCHRAFFT'S
SWIFT & CO.

WHEN companies like Standard Oil buy equipment, that equipment must measure up to all requirements of permanent satisfaction and economy. It was quite natural, therefore, that Reed Air Filters were selected for the air-cleaning requirements in the new Standard Oil Building at 26 Broadway.

Because of their recognized advantages and superior performance, Reed Air Filters have been ordered *and reordered* by hundreds of exacting users for every air-filtering purpose from general ventilation to highly technical processes. Whatever *your* demands may be, Reed Filters will insure the highest degree of satisfaction at the lowest operating cost. The Reed Blue Book tells the story—send for it, using the coupon for convenience.

REED AIR FILTER COMPANY, *Incorporated*
215 CENTRAL AVENUE, LOUISVILLE, KENTUCKY
Offices in Principal Cities

Reed Air

TRADE *filters* ALL METAL MARK

Use This

REED AIR FILTER CO., *Incorporated*
215 Central Avenue, Louisville, Kentucky

Send, without obligating me, a copy of the Reed Blue Book.

Name ..... City..... Possible Use.....

Company ..... State.....

How to heat low tanks

"If we cannot have more height in the boiler room, it will be necessary to go down with a pit," is something no owner likes to hear.

It is often a problem to provide properly for the return from a steam coil. And—there's the old job where the coil hammers, is partially flooded, and leaks from time to time and has to be repaired—or the condensation is wasted to the sewer and cold water fed to the boiler to replace the hot condensation being wasted, at considerable daily waste of fuel.

The Engineering Department of Thermal Appliance Company points to the SEMI-INDIRECT with a good deal of pride, and recommends this new method of heating water as a satisfactory answer to many of these problems, which have been troublesome for so long a time.

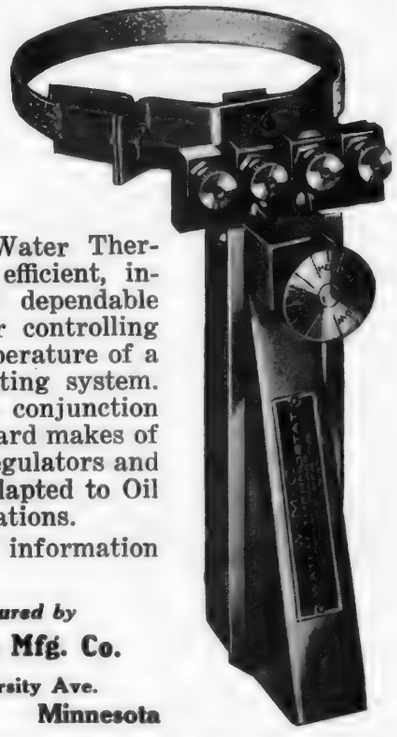
No water line troubles—the heater itself has a water line, two-thirds below the water line, one-third with steam. Circulation starts 36 to 49 inches below the water line, giving a good head to a tank, although low. There is a substantial saving in fuel because heat is being passed to the tank when the fire is banked at night, or on mild days—when, otherwise the fire is wasted.

Copyrighted 1926 by
Thermal Appliance Co., 342 Madison Ave., New York

W-M-C Water Thermostat

For Dual Control

Clamps on the Riser

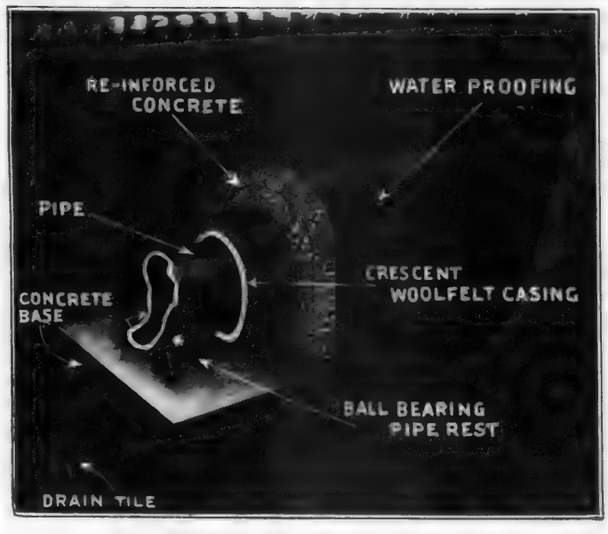


The W-M-C Water Thermostat is an efficient, inexpensive and dependable instrument for controlling the water temperature of a hot water heating system. It operates in conjunction with the standard makes of electric heat regulators and is especially adapted to Oil Burner installations.
Write for full information and prices.

Manufactured by

The White Mfg. Co.

2362 University Ave.
St. Paul, Minnesota



THE CRESCENT SYSTEM

Dirt-Proof Ball Bearings, and Air Space Around Pipe, Permits Rotation of the Pipe, Adding Years to its Life.

Manufacturers and Contractors of

UNDERGROUND STEAM DISTRIBUTING SYSTEMS
TUNNEL OR CONDUIT CONSTRUCTION

"We solicit your correspondence"

W. H. PEARCE & CO.
115 S. Dearborn Street
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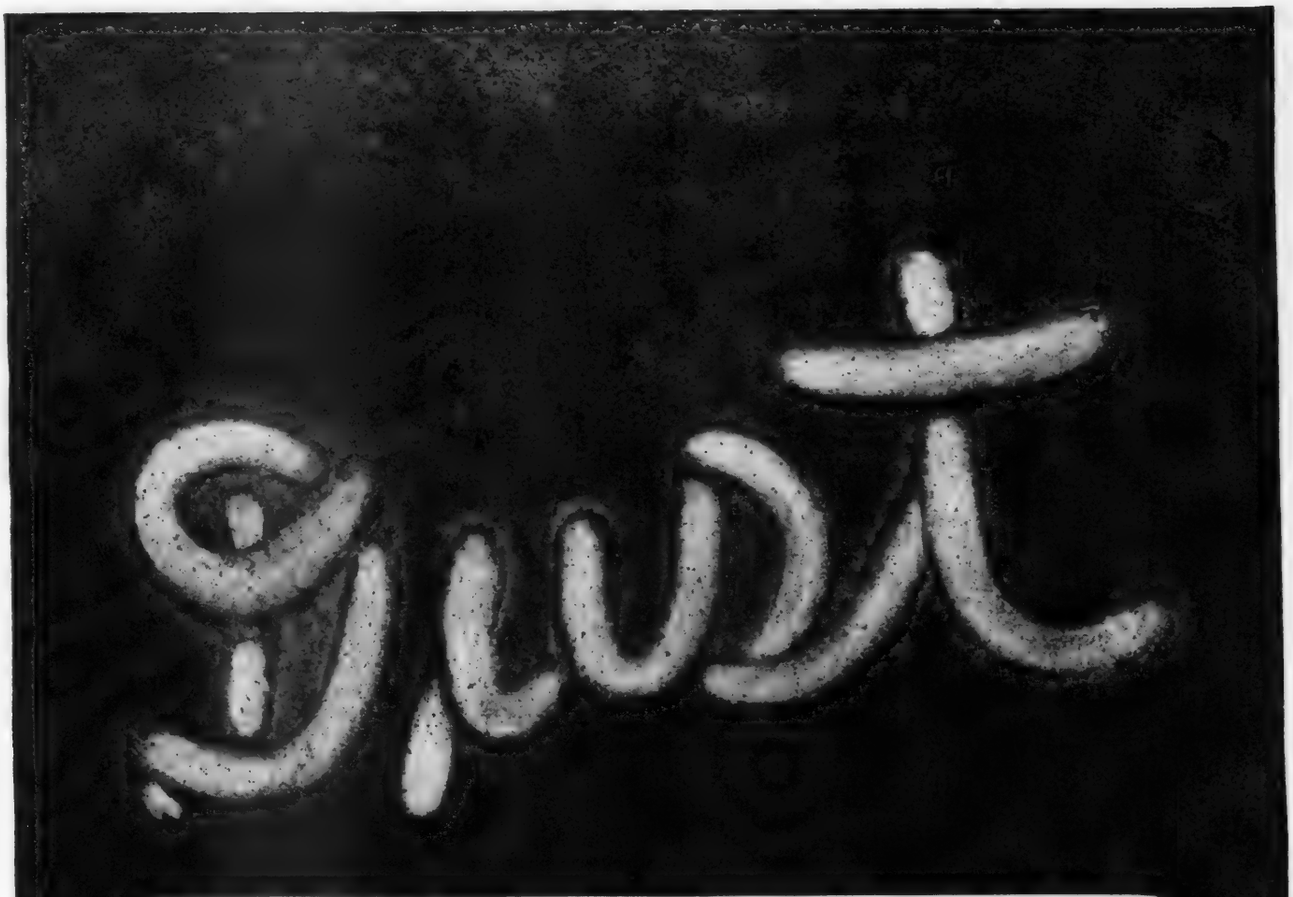
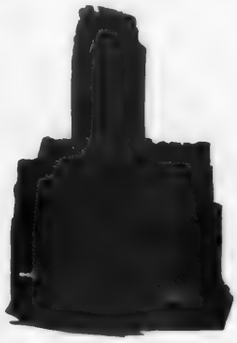
Catalog on Request



Dust-Free Air at Lowest Operating Cost



New York Telephone Building, New York City.

This is one of hundreds of buildings designed by prominent architects, and erected in all parts of the country, in which clean air, free of all harmful dust and bacteria, is supplied by Midwest Air Filters.

For ventilating buildings of every kind; for protecting equipment or processes, and for improving working conditions in the industrial field, Midwest Air Filters have demonstrated these points of superiority in hundreds of completely satisfactory installations:

Their operating resistance is lowest, at the high efficiency and capacity delivered. Their dust capacity is greatest.

They are unsurpassed in cleaning efficiency.

Their overall operating costs are practically negligible, rarely exceeding 4c a day per thousand cubic feet of air per minute cleaned.

They are standard equipment in which each unit is an exact duplicate of all other units, and in which high efficiency, low resistance, and high dust capacity are combined without sacrificing any one or two of these to increase the rest.

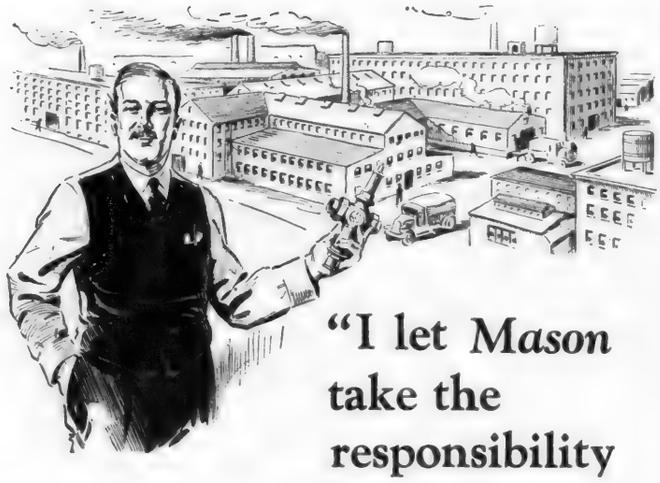
You will make no mistake if you specify Midwest Air Filters, without alternates, on any of your ventilating jobs.

Our new Bulletin HC-1 covers Building Ventilation, and Bulletin HC-2 covers Industrial Ventilation. Ask for as many copies as you want.

MIDWEST AIR FILTERS
INCORPORATED

BRADFORD, PA.

Sales Offices in Principal Cities



"I let *Mason* take the responsibility for pressure control"

I have too much on my mind to worry about inaccurate pressure control. That's why I depend upon Mason Regulators to take that burden off my shoulders.

Mason No. 236 Lever Style Reducing Valve for Heating Systems.

For the lasting accuracy and reliability that mean genuine economy, Mason Regulators are unsurpassed. No matter what the service required, there's a *Mason* designed expressly for that service.

May we send you our Catalog 62?

9153

Mason Regulators
MASON REGULATOR CO.
Boston, Mass.

How To Improve On Heating and Ventilating Systems

Bristol's Recording Thermometers placed at various points throughout your buildings provide the best possible check on heating and ventilating systems.

Let a Bristol's Chart Record show you where you can improve existing conditions.

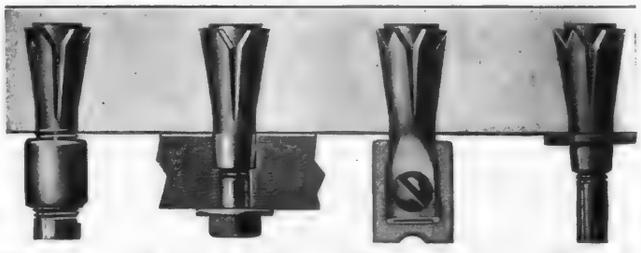
Bristol's Recording Thermometers are furnished for all ranges of temperature from −60° to +1000°F. and in models to suit individual requirements. They are rugged in construction and require very little attention.

Write for Bulletins

The Bristol Company *Waterbury, Connecticut*

FOR 36 YEARS — Ask Any Technical Engineer — MAKERS OF

BRISTOL'S RECORDING INSTRUMENTS



Phillips Self-drilling Expansion Shells

For fastening all types of hangers to concrete ceilings, side-beams, columns and walls, and for bolting timbers and other equipment to concrete and stone.

Installing Self-drilling Shells in Concrete

Every shell is a drill and makes its own hole, thus eliminating drill trouble and expense.

A new sharp drill for every hole and a smaller hole per given size bolt reduces labor cost of installing to absolute minimum.

A perfect fitting hole and the enlargement of shell and hole at extreme bottom insures reliability and better workmanship.

Quickly installed with the Phillips Spring Hammer, or with special hand chucks.

Ceiling with Phillips Spring Hammer Drill

Manufactured by

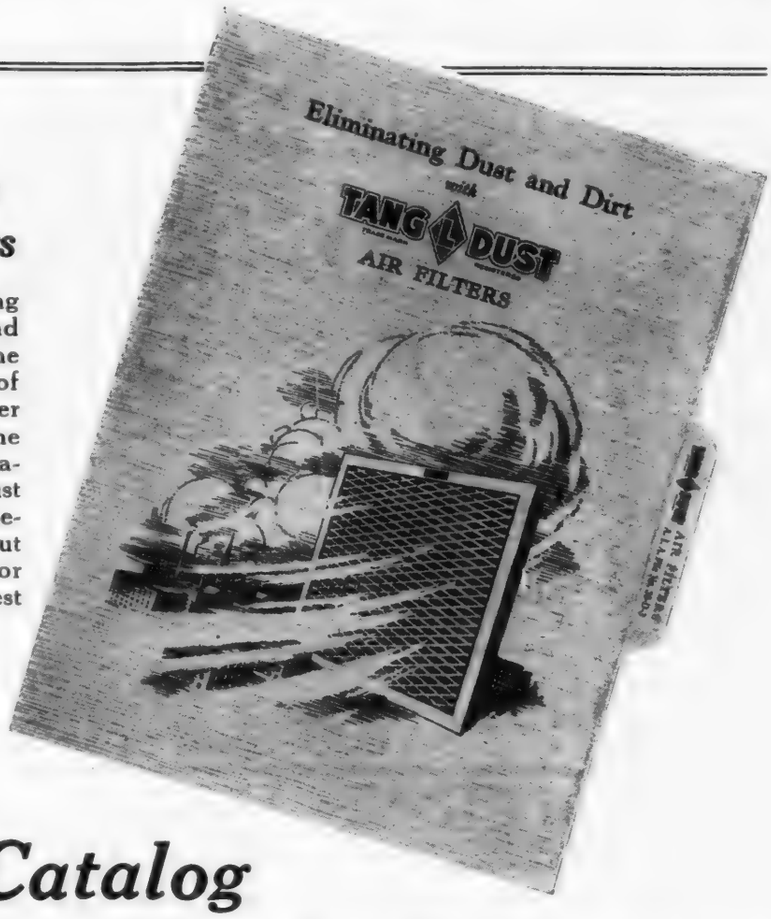
PHILLIPS DRILL COMPANY

1537 Cortland Street CHICAGO, ILL.

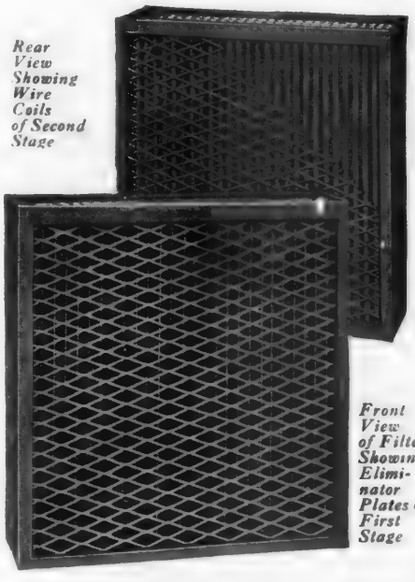
TANG L DUST
TRADE MARK REGISTERED

Heating and Ventilating Engineers and Contractors

Everyone interested in clean air for building ventilation and industrial plants should send for a copy of this new catalog, just off the press. It tells about an entirely new type of air filter constructed in two stages for greater efficiency and with a renewable oil pad at the top of each filter cell. Where the specifications call for the use of air filters, Tangldust Air Filters will meet the most rigid requirements of architects and engineers throughout the country. On your next job ask us for a quotation and the name of our nearest representative.



Send for New Catalog
On TANGLDUST Air Filters



Rear View Showing Wire Coils of Second Stage

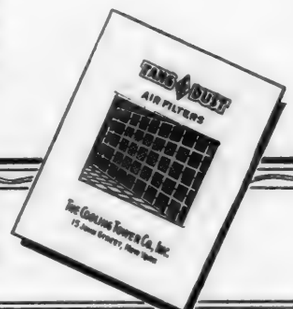
Front View of Filter Showing Eliminator Plates of First Stage

This catalog summarizes the outstanding features and advantages of Tangldust Air Filters over other and older types with which you may be familiar. The Tangldust Air Filter cell is not simply a frame filled with either mineral wool or expanded metal. It is a carefully designed piece of engineering apparatus, built to meet the requirements for correct air filtering equipment.

Low Resistance to the Air Flow

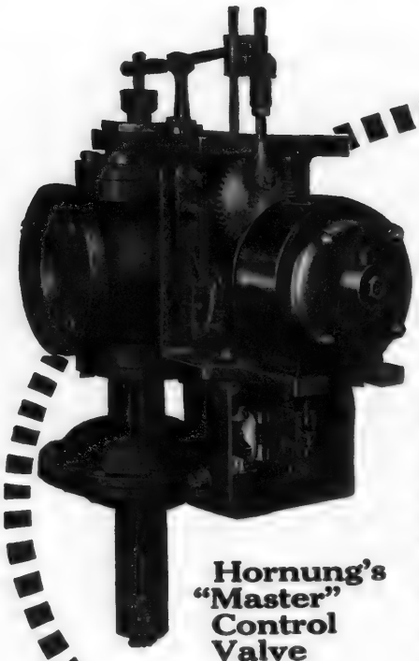
Constructing the Tangldust Air Filter in two stages provides for the elimination of 97% of the dust and dirt in the air, prevents the filter from building up a resistance to the air flow and allows it to be easily cleaned. An oil pad at the top of each filter cell is renewed with oil at each charging, giving additional life to the filter and preventing it from drying out between chargings.

These features cut upkeep costs considerably and save the replacement of filter cells later on. Tangldust Air Filters are adapted for all types of general and electrical ventilation, air compressors and internal combustion engines, drying operations, dust recovery and bacteria control. Write for your copy of Catalog H-6.



TANG L DUST AIR FILTERS
TRADE MARK REGISTERED

MADE BY THE COOLING TOWER COMPANY, INC.- 15 JOHN STREET, NEW YORK



Hornung's "Master" Control Valve

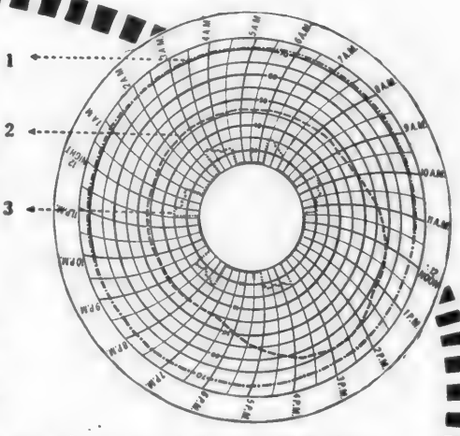
CENTRAL STATION & INDUSTRIAL HEATING & LIGHTING JCH

Do You Heat "All Outdoors"?

It is safe to say that except in extremely cold weather at least as much heat from Central Stations is thrown out of windows as is used to warm interiors.

The only way to correct this condition is to control the volume of heat *supplied*, in direct proportion to the amount *needed*.

Hornung's Master Control Valve is doing this in hundreds of buildings. It automatically cuts off the heat supply when not needed—and this saving is immediately felt at the source, cutting down very perceptibly the waste of fuel.



The chart at the right is reproduced from one of many made by recording thermometers under average service conditions. Curve 1 shows temperature maintained in the building for 24 hour period. Curve 2 shows outside temperature at same time. Curve 3 shows how often the valve was opened and closed, and how long steam was on building—altogether 9 hours out of the 24.

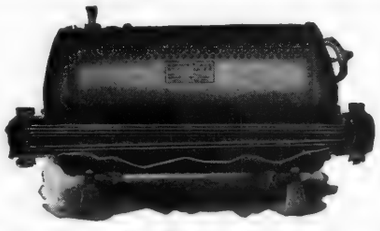
Which demonstrates that when outdoor temperature is above freezing, as it is by far the greater part of the heating season, steam is *needed* only a small percentage of the time, to maintain proper conditions inside.

Let us tell you how you can save heat through the "Master" Control Valve.

HEAT LOSS IS MONEY LOSS (3409)

CENTRAL HEAT APPLIANCES

343 S. Dearborn St. J. C. HORNUNG ENGINEER Chicago, Illinois.

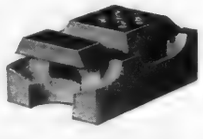


Alberger-Buffalo Storage Heaters have tubes the full length of tank which insures maximum heat transfer. Satisfaction guaranteed. Write for information on Alberger Multi Head Heaters and Howard Guided Expansion Joints.

ALBERGER HEATER COMPANY
HOWARD IRON WORKS
281-289 Chicago St. Buffalo, N. Y.

Burn Anything from Egg to Screenings with Pyramid Grates

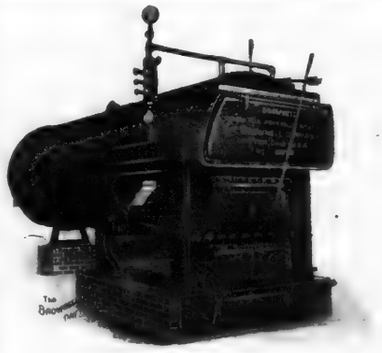
The wide range in fuel which **Pyramid Grates** burn makes them highly economical.



Write for testimonial letters showing 65% saving in fuel bills.

Let Us Send Full Details

PYRAMID IRON PRODUCTS CO.
136 Liberty Street New York City



Brownell Return Flue Portable Heating Boiler—Smokeless Type

BROWNELL

Better Boilers for Heating and Power Purposes
70TH YEAR

of successful manufacturing experience. This is the reason why Brownell Boilers are specified by all the leading Heating and Contracting Engineers.

BROWNELL Steel Heating Boilers are
LOW IN FIRST COST
HIGH IN EFFICIENCY
BUILT TO LAST A LIFETIME

Our reputation is your insurance of a high quality product. Let us solve your heating problems. Sales representatives in all principal cities. Send for them.

THE BROWNELL CO.
DAYTON, OHIO

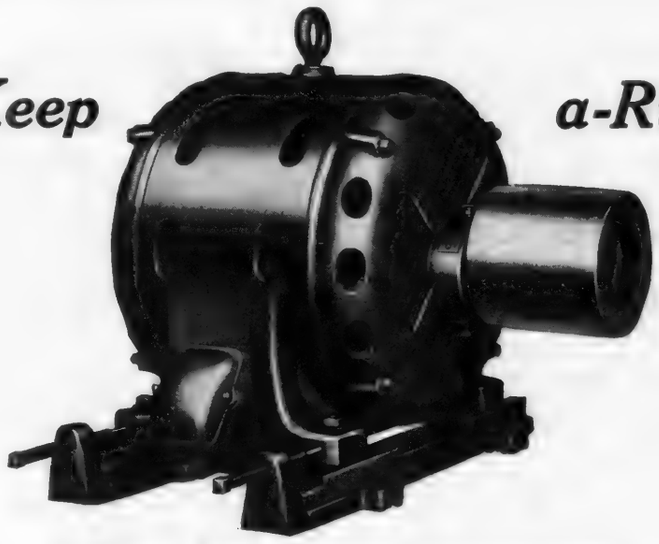
THE BROWNELL COMPANY The World Over DAYTON, OHIO, U.S.A.

Established 1855

Send for Bulletins B6 B6A

BOILERS

"They Keep a-Running"



7½ Horse Power Century Automatic-start Induction Polyphase Motor

Only One Set of Fuses Needed

The low starting current of Century Automatic-start Induction Polyphase Motors makes it possible to use a single set of fuses for both starting and running.

Other advantages of Century Automatic-start Induction Polyphase Motors are:

1 They may be started automatically or by remote control; no skilled attendants are necessary.

2 No controller or other special starting device is required—any approved single-throw switch may be used.

3 They develop a static torque of not less than 225% of full load torque.

4 Starting current does not exceed 245% of full load current.

Century Automatic-start Induction Polyphase Motors are built in all standard sizes from ½ to 60 horse power. Temperature rise is not more than 40° Centigrade.

Send for complete information.

CENTURY ELECTRIC COMPANY

1806 Pine St. St. Louis, Mo.

29 Stock Points in the United States and More Than 50 Outside Thereof

½ to 60 H.P. Century MOTORS ½ to 60 H.P.

NATIONAL Storage U BEND TYPE Heater

As indispensable as medicine

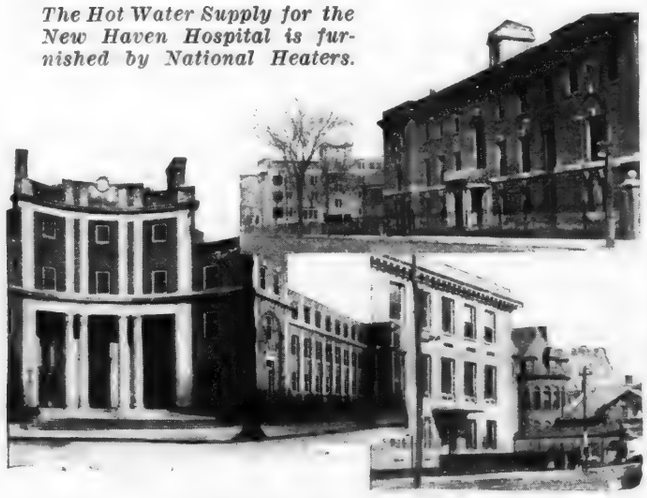
Here in a big hospital spread over several city blocks, National Storage Heaters supply a need almost as important as medicine and drugs. Constantly day and night there must be plenty of hot water in every ward. The responsibility of measuring up to this demand is well placed in National Heaters for it was their long record of many successful installations that led to their choice.

For Hotels, Apartment Houses, Clubs, Office or Municipal Buildings, Colleges or Y. M. C. A.'s the National is the ideal Storage Heater.

Write for a National Engineer to call.
Bulletin 65 on request.

The National Pipe Bending Co.
Established 1883
120 River St., New Haven, Conn.
Boston New York Philadelphia

The Hot Water Supply for the New Haven Hospital is furnished by National Heaters.



The Standard Storage Heater of the Building Trade

Cash in on Thatcher Publicity!

Efficient Triangular revolving grates—standard equipment for all Thatcher Round Boilers.

RIGHT NOW—in hundreds of newspapers—all over the country—we are intelligently and vigorously advertising Thatcher Boilers, Furnaces and Ranges.

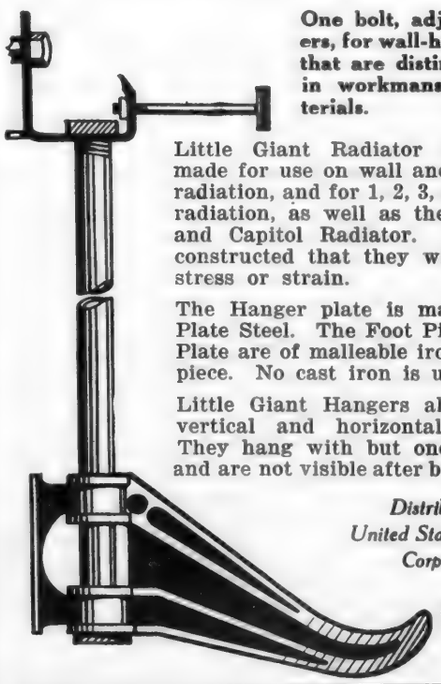
Thousands of easily sold prospects are being created each and every day. Many of them are in your community and you can—with slight trouble—turn them into actual buyers.

Now—while your prospects are enthusiastic—is the time to cash in on some real boiler business. Write us, TODAY, and we will tell you how!

THE THATCHER COMPANY
Formerly Thatcher Furnace Co.
341 N. Clark St., Chicago, Ill. Since 1850 39-41 St. Francis St., Newark, N. J. 21 W. 44th St., New York

THATCHER
BOILERS-FURNACES-RANGES

Little Giant Radiator Hangers



One bolt, adjustable hangers, for wall-hung radiation, that are distinctly superior in workmanship and materials.

Little Giant Radiator Hangers are made for use on wall and double wall radiation, and for 1, 2, 3, and 4 column radiation, as well as the Corto, Aero and Capitol Radiator. They are so constructed that they will stand any stress or strain.

The Hanger plate is made of Boiler Plate Steel. The Foot Piece and Back Plate are of malleable iron cast in one piece. No cast iron is used.

Little Giant Hangers allow for both vertical and horizontal adjustment. They hang with but one anchor bolt and are not visible after being installed.

Distributed by United States Radiator Corporation

Sold by all Leading Jobbers

Little Giant Mfg. Company
1927-31 Nicollet Ave., Minneapolis, Minn.

Athey

(Patented)

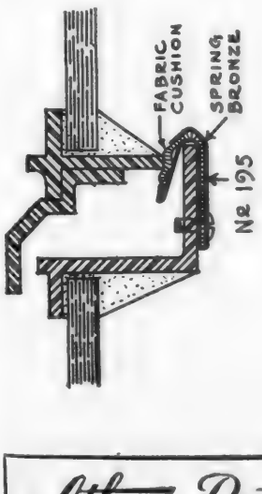
Cloth-Lined Metal Weatherstrip

Keeps the Heat In and the Drafts and Dust Out

Every time Athey Cloth-Lined Metal Weatherstrip is tested in competition with others it proves its greater efficiency. It is the ***only cloth-lined*** metal weatherstrip made. And experience demonstrates conclusively that a cloth-to-metal contact is the only one that actually "seals" the windows against drafts and dust.

In the Athey strip the metal rail slides smoothly and easily in a ***cloth-lined metal channel.*** The cloth hugs the rail tightly, making a perfect "seal." Yet the windows open and close easily.

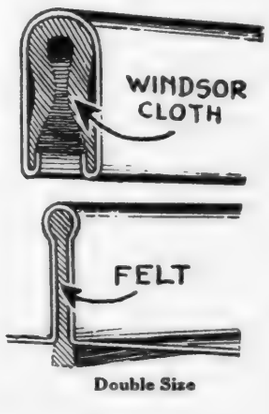
Such notable buildings as The Blackstone, The Drake and Edgewater Beach Hotels, The London Guarantee, Peoples Gas and Twin Wrigley Buildings in Chicago—and thousands of others—have installed Athey Cloth-Lined Metal Weatherstrip **because they found it was the best to be had.**



The Only Weatherstrip that Makes a Perfect Seal for Both Wood and Metal Windows

Athey Cloth-Lined Metal Weatherstrip for drawn steel windows. Notice the cloth and spring bronze contact. This strip is recommended by leading manufacturers of steel sash as the one practical and efficient weatherstrip made.

Athey Cloth-Lined Metal Weatherstrip for wood sash. The cloth-to-metal contact keeps out all drafts, dust and noise, yet is sufficiently pliable so the windows can be opened easily.



Double Size

Athey Products

Perennial Window Shades
Cloth-Lined Metal Weatherstrips
Athey Disappearing Partition
Athey Skylight Shades

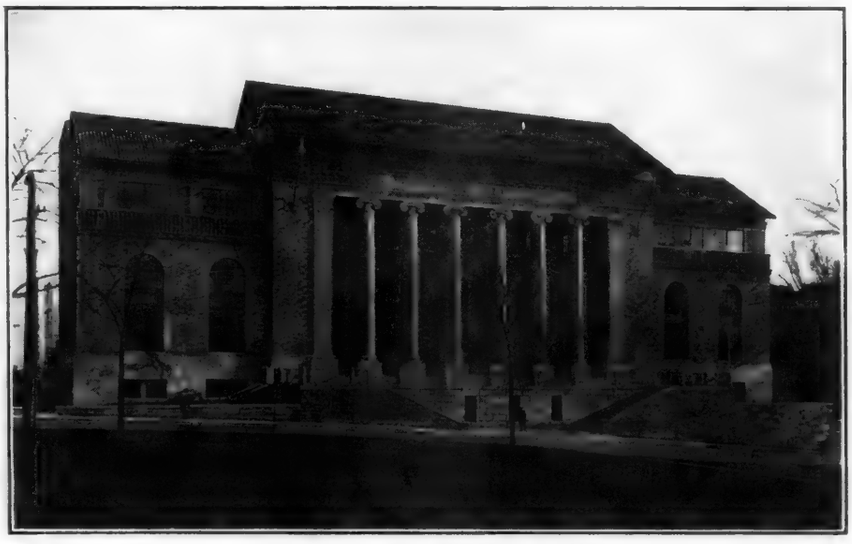
SEE OUR CATALOGUE IN SWEETS

Write for complete information and prices

Athey Company

6067 West 65th Street • • Chicago, Illinois

In Canada: CRESSWELL-McINTOSH, Reg'd.
270 Seigneurs St., Montreal, Que.



HOME OF "THE HARTFORD TIMES".
Donn Barber, Architect Werner Nygren, Engineer C. H. Cronin, Plbg. Contr.

Just a detail! . . .

"The hot water question is just a detail when you consider the entire job."

Yes, that is true, but how many details have to go wrong before the architect or owner is convinced that he has employed the wrong engineers?

Whitlock Heaters are taking care of the hot water detail in The Hartford Times building, illustrated, and in thousands of other buildings. One detail sure to be on the right side of the books.

Whitlock Engineers stand ready to take this whole troublesome detail out of your hands—all you have to do is to remember that if it is

"HOT WATER?—LET WHITLOCK DO IT"

WHITLOCK HEAT TRANSFER PRODUCTS

THE WHITLOCK COIL PIPE COMPANY, 40 South St., Hartford, Conn.

New York Boston Philadelphia Chicago Baltimore San Francisco
and other principal cities. Consult telephone book.

INSTANT HOT WATER
WITH
DAHLQUIST AQUATHERM COPPER RANGE BOILER

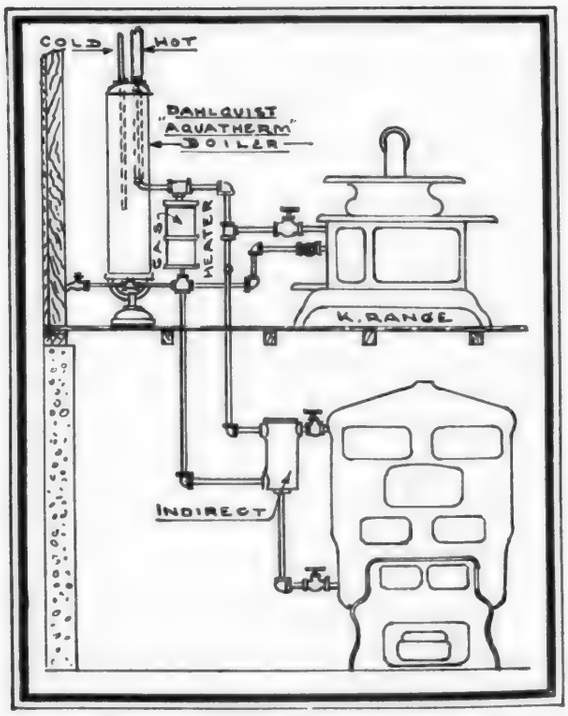
The first improvement in range boiler construction in many years provides instant hot water to the consumer at minimum cost.

The Dahlquist Aquatherm Copper Range Boiler will reduce by one-half the cost of installing a gas tank heater on any job and will provide all the convenience of an instantaneous heater either from the ordinary gas tank heater, water back in coal range, indirect heater or coil in boiler or furnace, or electric heater. Range boiler acts as storage heater when hot water is not being used.

The Dahlquist Aquatherm can also be furnished separately to be installed in range boiler now in use whether heated by gas, coal, wood or electricity.

Let us send full details

DAHLQUIST MFG. CO.
40 WEST 3rd STREET, BOSTON, MASS.



Dahlquist Aquatherm Copper Range boiler installed in connection with gas tank water heater, water back in coal or wood kitchen range in kitchen, and indirect water heater in cellar.

Cork Lined Houses Make Comfortable Homes

Residence of E. D. Otto, Contractor, Downers Grove, Illinois, insulated with 3000 square feet of Armstrong's Corkboard.

How cork house insulation aids the engineer

MANY an engineer has been blamed for a coal-wasting, inefficient heating plant when in reality, a poorly-built, cold, drafty house is at fault.

But there is seldom any cause for criticism when the heating plant is installed in a cork-insulated house.

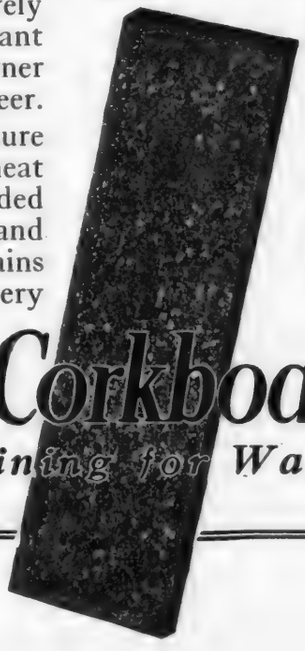
In a house lined with Armstrong's Corkboard, the engineer can specify a considerably smaller sized heating plant with safety. A smaller sized plant will heat the cork-lined house effectively with less fuel. It will be a constant source of satisfaction to the owner and a lasting credit to the engineer.

Armstrong's Corkboard is pure cork, one of the most effective heat insulators known. Nothing is added in the manufacture. On the walls and roof of a house, it effectively retains the heat indoors, making every unit produce its full quota of comfort.

Armstrong's Corkboard is recommended in a thickness of 1½ inches on walls and 2 inches under roof. In this thickness, it will pay for itself in fuel saved in a short time.

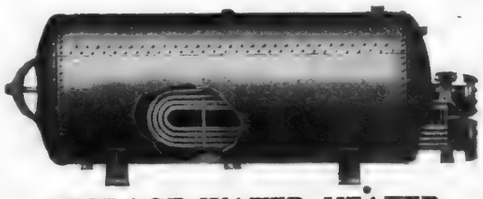
Builders agree that the house of the future will be insulated. You will be asked to design heating plants for the insulated house. Write today for complete information on how to figure the saving in radiation in houses lined with Armstrong's Corkboard. Address: Armstrong Cork & Insulation Co. (*Division of Armstrong Cork Co.*), 202 Twenty-fourth St., Pittsburgh, Pa., McGill Bldg., Montreal, Quebec. Armstrong Cork Company, Ltd., Sardinia House, Kingsway, London, W. C. 2, England.

Ⓐ Reg. U. S. Pat. Off.



Armstrong's Corkboard Insulation

A Heatproof Lining for Walls and Roofs



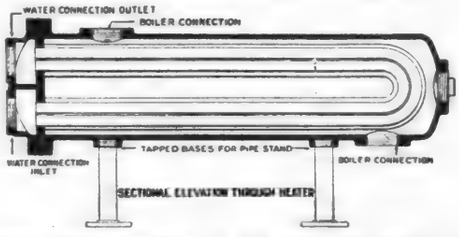
STORAGE WATER HEATER

Where large quantities of hot water are held in reserve for intermittent use. Will heat from 200 to 20,000 gals. per hour, up to 180 F.

DOMESTIC WATER HEATER

For dwellings. Fits any steam, vapor or hot water system. Capacities from 30 to 300 gals.

U TUBE INSTANTANEOUS HEATER



When large quantities of hot water are used constantly. Will heat from 200 to 10,000 gals. through any range of temperature.

For Small Dwellings or for Big Buildings

When you specify a hot water heater either for the smallest of private dwellings or the largest of public buildings, apartments or hotels, you can safely write in "Paracoil Domestic Heater"—"Paracoil Storage Water Heater" or "Paracoil 'U' Tube Instantaneous Heater" according to the unit required.

The same careful workmanship, the same guarantee of performance, the same hot water satisfaction, given with each type. In any case the safe word to specify is *"Paracoil"*.

Our engineers will be pleased to figure out the best type and the proper capacities for you—and our rigid guarantee of performance stands back of their judgment.

Write for our Catalog or send us your requirements and let us furnish you sizes and prices.

DAVIS ENGINEERING CORP.
90 WEST STREET, NEW YORK CITY
FACTORY: ELIZABETH, N. J.

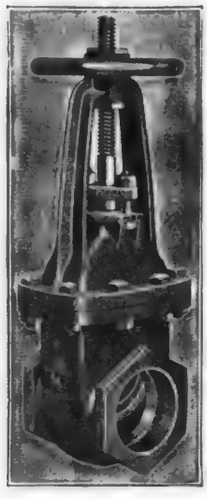
Paracoil
WATER HEATERS

IRON BODY GATE VALVES

SCREWED, FLANGED
AND
HUB END STYLES

NON-RISING STEM
AND
O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings



Illinois Malleable Iron Company

1801 Diversey Parkway Chicago, Ill.

Bailey WATER HEATER (GAS)

Made by
PIATT WATER HEATER CO.
Lansing, Michigan

and

use them too

DAY AND NIGHT

Made by
DAY & NIGHT WATER]]
HEATER CO.
Monrovia, California

Barber Patented Jet Gas Burners

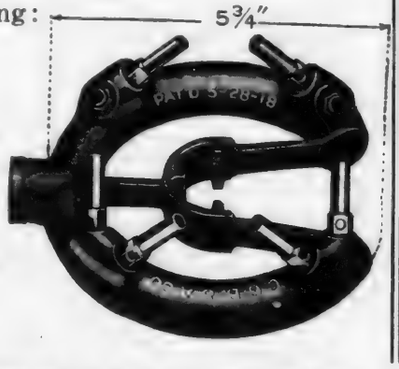
The Day and Night Junior Automatic Storage Gas Water Heater and the Bailey Gas Water Heater are good examples of American genius in hot water producing devices. They were designed to deliver hot water at an exceptionally high efficiency. There is a size of each heater for every home and every service. It is but natural that heaters of such excellence as the Day and Night and Bailey should be equipped with the best of accessories, including the Barber Patented Jet Gas Burner.

The Barber is a burner that lowers gas consumption while giving that hot blue flame, eliminates back-firing and does away with carbon deposits that gradually lower efficiency.

Manufacturers of gas appliances will find us ready to subject their appliances to accurate tests in our well-equipped laboratory at no expense to the manufacturer in the effort to attain a greater degree of efficiency through the use of Barber Jet Burners. Tell us your problems and we will strive earnestly for a correct solution. Our descriptive literature and prices of Barber Jet Burners will be mailed on request.

Among the many Heater Manufacturers who have adopted and are using "Barber Patented Jet Gas Burners" are the following:

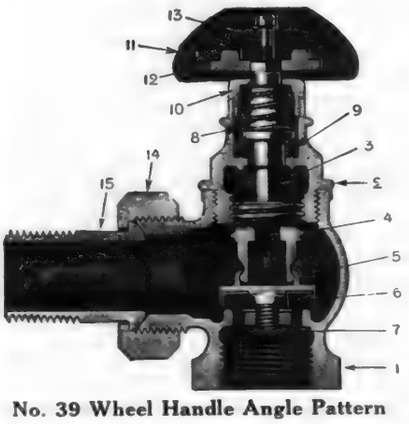
American Radiator Co.
Barton-Roth Co.
Bastian-Morley Co.
Bryan Steam Corp.
Coast Heater Mfg. Co.
Day & Night Water Heater Co.
Detroit Range Boiler & Steel Barrel Co.
Geneva Heater Co.
Gewert Mfg. Co.
Hoffman Heater Co.
Hotstream Heater Co.
Edw. Katzinger Co.
Lovekin Water Heater Co.
Melrose Water Heater Co., Inc.
The New Way Mfg. Co., Inc.
Piatt Water Heater Co.
Sands Mfg. Co.
Simplex Heater Co.
Snap-O-Stat Co.
Southard Robertson Co.
Superbo Water Heater Co.
Superbo Mfg. Co.
Welsbach Co.
Walter Mork Heater Co.



The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

McALEAR

RADIATOR VALVES AND TRAPS
FOR VAPOR AND VACUUM HEATING SYSTEMS



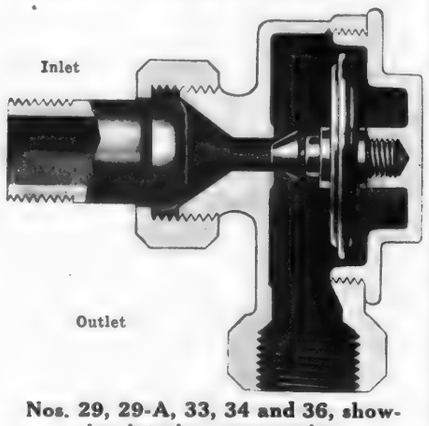
No. 39 Wheel Handle Angle Pattern

THIRTY-FIVE REPRESENTATIVES

To give you prompt service on heating and power problems.

CATALOG No. 28

Giving complete information, prices, installation-engineering blueprint data sent on request.



Nos. 29, 29-A, 33, 34 and 36, showing interior construction

Loose Leaf Pages Showing the Complete McAlear Line of Heating and Power Specialties, with Blueprint Installation Data, to fit T.E.B. or Kalamazoo Binders will be Sent on Request.

McALEAR MFG. CO.
1901-7 So. Western Ave.
CHICAGO

"Keeping Others In Hot Water"—

for
Hotels, apartment buildings, hospitals, Y. M. C. A. buildings, schools and laundries

Special Attention Given to Installations Requiring Large Quantities of Hot Water, with Live or Exhaust Steam as the Heating Medium.

—may be a pastime for some folks, but for the Sims Company it is a serious proposition—a matter requiring a thorough knowledge of hot water requirements.

A long study of these requirements enables us to offer heaters that assure constant and efficient hot water service.

Engineers feel safe in specifying "SIMS" because they know it means **reliability**—a service you want to render your client.

SIMS CLEAN E-Z STEAM TUBE STORAGE HEATER

Our Engineers will gladly confer with you, without obligation, on your hot water problems.

THE SIMS CO.

Erie, Pa.

A good place to live, to work and to play.

There's an

Arco Packless Valve

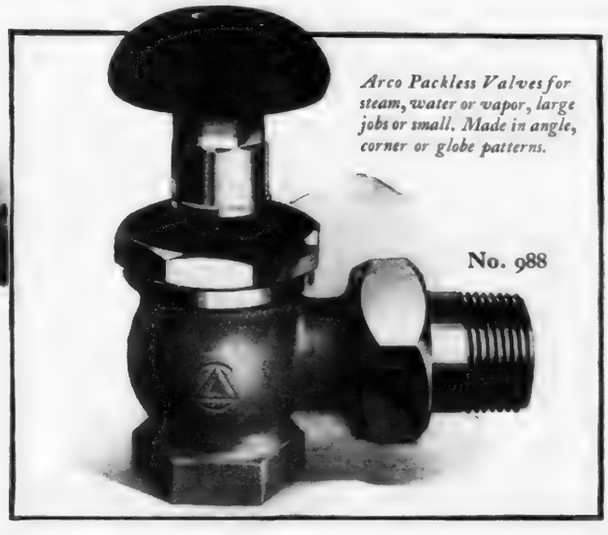
on every radiator in Detroit Towers

DETROIT TOWERS, DETROIT, MICH.
WALTER W. AHLSCHLAGER, ARCHITECT
GLANZ & KILLIAN, HEATING CONTRACTORS

YOU expect to find Arco Packless Valves on a job like this. The owner can't afford to take a chance with the stuffing-box type of valve where the chances for leaks are so numerous. Doesn't it follow that the owner of the smaller job is entitled to this same refinement?

Here are excellent reasons for using Arco Packless Valves on any job, large or small:

1. Arco Packless Valves are good looking. They add a finishing touch of smartness—an evidence of quality throughout.
2. They pay for themselves by saving the repeated expense of repacking.
3. They prevent leaks—any one of which costs more than the offending valve.
4. They add to the comfort of the owner and his tenants because they open wide with one smooth turn.



Arco Packless Valves for steam, water or vapor, large jobs or small. Made in angle, corner or globe patterns.

No. 988

Arco Packless Valves are made and guaranteed by

AMERICAN RADIATOR COMPANY

Specialties Department

816 S. Michigan Avenue, Chicago, Ill.

No. 5—This is the fifth of a series of advertisements listing Scott Valves

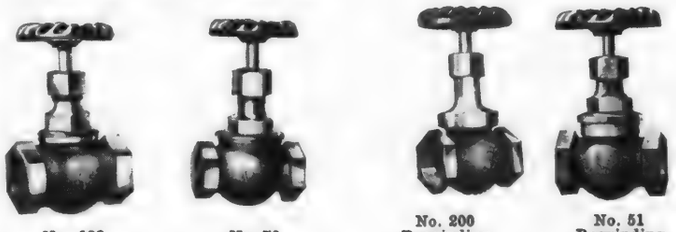
Scott Bronz Globe & Angle Valves

No. 192	—S.E.	Globe—Bronze Disc	125 lbs. S.W.P.
No. 193	—S.E.	Angle—Bronze Disc	125 lbs. S.W.P.
No. 70	—S.E.	Globe—Jenkins Disc	150 lbs. S.W.P.
No. 71	—S.E.	Angle—Jenkins Disc	150 lbs. S.W.P.
No. 72	—F.E.	Globe—Jenkins Disc	150 lbs. S.W.P.
No. 73	—F.E.	Angle—Jenkins Disc	150 lbs. S.W.P.
No. 200	—S.E.	Globe—U.B. Regrinding	200 lbs. S.W.P.
No. 201	—S.E.	Angle—U.B. Regrinding	200 lbs. S.W.P.
No. 202	—F.E.	Globe—U.B. Regrinding	200 lbs. S.W.P.
No. 203	—F.E.	Angle—U.B. Regrinding	200 lbs. S.W.P.
No. 249	—S.E.	Angle—U.B. Regrinding	250 lbs. S.W.P.
No. 250	—F.E.	Angle—U.B. Regrinding	250 lbs. S.W.P.
No. 251	—S.E.	Globe—U.B. Regrinding	250 lbs. S.W.P.
No. 252	—F.E.	Globe—U.B. Regrinding	250 lbs. S.W.P.
No. 49	—S.E.	Angle—Regrinding	250 lbs. S.W.P.
No. 50	—F.E.	Angle—Regrinding	250 lbs. S.W.P.
No. 51	—S.E.	Globe—Regrinding	250 lbs. S.W.P.
No. 52	—F.E.	Globe—Regrinding	250 lbs. S.W.P.

Scott Iron Body Globe & Angle Valves

No. 76	—S.E.	Globe—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 77	—F.E.	Globe—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 80	—S.E.	Angle—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 81	—F.E.	Angle—Comp. or Cop. Disc	125 lbs. S.W.P.
No. 208	—S.E.	Globe—Regrinding Br. Disc	175 lbs. S.W.P.
No. 209	—F.E.	Globe—Regrinding Br. Disc	175 lbs. S.W.P.
No. 210	—S.E.	Angle—Regrinding Br. Disc	175 lbs. S.W.P.
No. 211	—F.E.	Angle—Regrinding Br. Disc	175 lbs. S.W.P.
No. 55	—S.E.	Angle—Regrinding Br. Disc	250 lbs. S.W.P.
No. 56	—F.E.	Angle—Regrinding Br. Disc	250 lbs. S.W.P.
No. 57	—S.E.	Globe—Regrinding Br. Disc	250 lbs. S.W.P.
No. 58	—F.E.	Globe—Regrinding Br. Disc	250 lbs. S.W.P.

There's a Scott Valve for every Service



No. 192 Standard Globe 125-lb. S.W.P. — No. 70 J.D.Type Globe 150-lb. S.W.P. — No. 200 Regrinding Globe 200-lb. S.W.P. — No. 51 Regrinding Globe 250-lb. S.W.P.

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SCOTT SINCE 1886 VALVES

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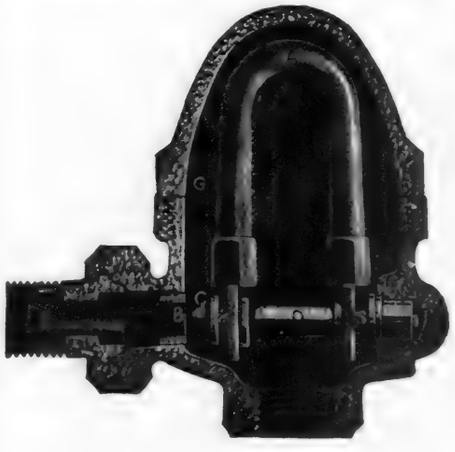

The Perfect Automatic Valve for Vacuum or Vapor Heating

The "Vento" Automatic Valve represents a steady improvement in the Haines line of steam traps and offers the highest degree of steam trap efficiency.

There has been no change in the old reliable principle that has placed Haines Automatic Valve in a class by itself. The operating power is identical—the only difference being in the general construction.

Special features are: Horizontal mounting of valve mechanism—long range of movement—positive action—quick opening and closing.

"VENTO" Advantages

System starts with valve wide open, assuring circulation almost the instant steam is turned on.

Control of valve opening from two to eight times larger than other makes of valves.

Size of valve opening reduces danger of fouling with scale or other foreign matter.

Closes absolutely tight against steam. No necessity for use of spray water at pump.

Cannot stick or gum from foreign matter, and operation is absolutely noiseless.

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WILLIAM S. HAINES & CO.

12th & Buttonwood Streets

PHILADELPHIA, - - PA.

VENTO

How do you finish up a new or remodeled heating system?

MUST your fitters go back and blow down the boiler several times by old methods, or do they make a short job of it and put the rest of the time on productive work from which you get additional profits?

And can you deliver to the owner with every assurance of free steaming snappy circulation, a steadied water level, plenty of heat in all radiators on the cold days, and full heating value from every pound of fuel put into the boiler furnace?

YOU can make these questions disappear *completely* by applying Vinco to stop the foaming, priming and surging, because Vinco *permanently* removes causes as well as effects.

A properly designed system conditioned with Vinco is a strikingly good performer *from the start*, and afterwards is conspicuous for care-free boiler attendance and efficient heat absorption and transmission.

Giving your customer this satisfaction is good business. You will avoid complaints, shaken confidence and controversy about final payments, and the saving of steamfitter hours will add substantially to your profits.

Vinco thoroughly removes oil, grease, rust, scale and dirt without involving chemical reaction. Along with the oil and grease, Vinco takes much solid matter out of the boiler, so the only possible result is purer water and cleaner surfaces that are better able to transmit heat.

VINCO IS GUARANTEED ON A MONEY-BACK BASIS both as to its efficiency and its ability to bring about the desired improvement entirely without harm to any part of the heating system.

Vinco ingredients, processing and application are protected from infringement, and Vinco is never sold in bulk. For safety and full benefits, accept only cans bearing our name and registered trade mark. Buy from your jobber or, if necessary, direct from us. Mail the coupon.

THE VINCO COMPANY, INC., 75 Vesey St., New York.

Please advise where Vinco may be obtained and at what cost to clean out a heating system with _____ sq. ft. of radiation.

Name .....

Address .....

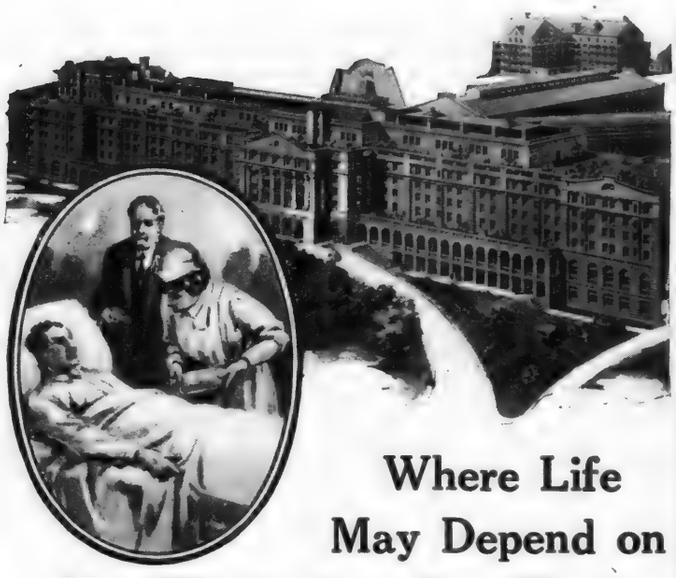
Name of Jobber .....

"I conquer" (*Latin*)

VINCO

conquers **foaming, surging, priming**

by removing **oil, grease, rust, scale and dirt**



Where Life May Depend on Hot Water You Can Trust

Patterson

Hot Water Heaters

In hospitals and sanitariums hot water has often got to be had *at once.* They cannot afford to *wait* when human lives are at stake.

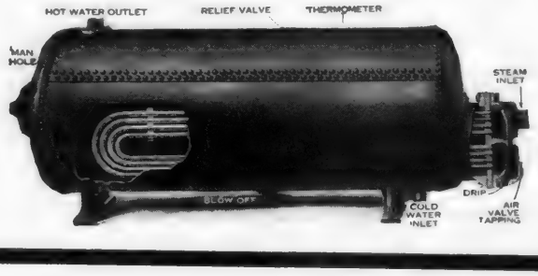
Because investigations convinced them that Patterson Hot Water Heaters could be absolutely depended upon to deliver all the hot water needed, as hot as desired, and as fast as it could be drawn, Patterson Hot Water Heaters were installed throughout the numerous buildings of the famous Battle Creek Sanitarium, Battle Creek, Michigan.

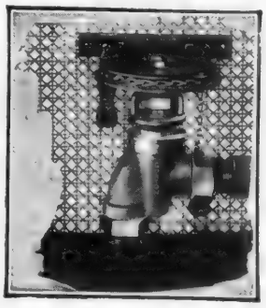
The efficient operation and long life of Patterson Heaters insure lasting satisfaction to their owners and reflect credit on the architects and engineers responsible for their installation.

Our Catalog may be had on request.

The Patterson-Kelley Co.

107 East 40th St. **New York City**





Behind the Grille

Front View

The GORTON CHAIN PULL VALVE

Provides Convenient Control of Radiators

Enclosed or Overhead

On any Heating System

We will be pleased to send full particulars on request.

Gorton & Lidgerwood Co.

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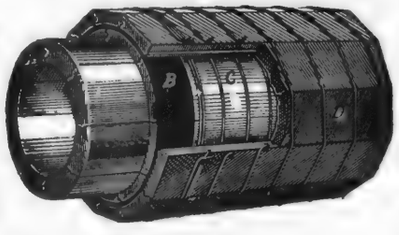
Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.

ROSS Crosshead-GUIDED Expansion Joint Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
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The Wainwright Improved Expansion Joint

Suitable for Pipe Movement of 1½ to 2 inches

Wainwright Improved Expansion Joint

THESE fittings are of the packless type—no stuffing box to be continually adjusted—no packing to blow out, deteriorate and require frequent replacement. The multiple corrugated copper expansion tube of uniform thickness and strength absorbs the movement.

Outside AND INSIDE expansion equalizing rings assure equal distribution of movement among the several corrugations.

The joint is protected from erosion and abrasive wear by the inner hard brass or copper sleeve which also affords smooth passage with least friction loss to steam, water, or gas being handled.

We will appreciate the opportunity of discussing special problems. Bulletin V-46, containing sizes, rating tables and layouts for typical installations, as well as information on Wainwright Anchors and Guides, will be sent on request.

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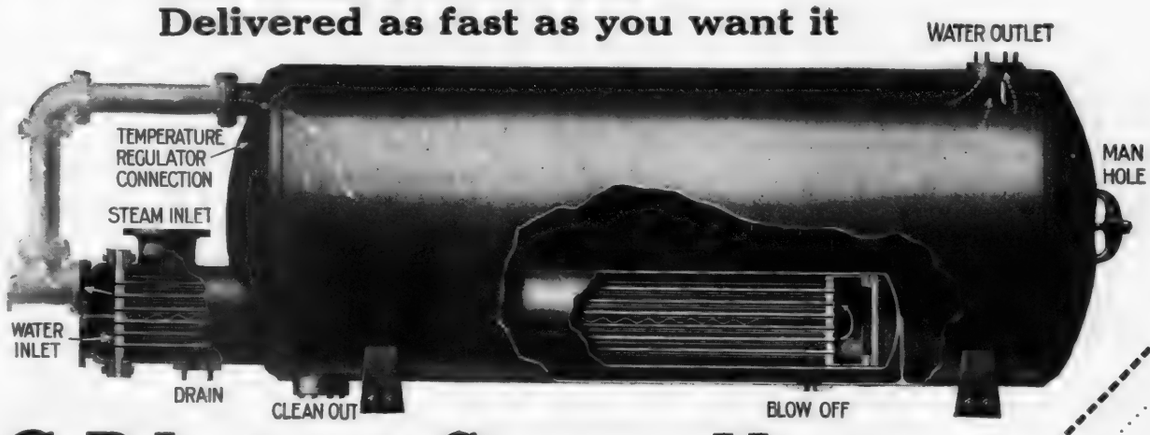
Hot Water—

Stored till you need it;
Delivered as fast as you want it



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(Patented)

Stores a tankful of hot water against sudden draws.
Gives hot water **instantaneously** when required.
Has tremendous overload capacity.
Occupies less space and requires less piping than an instantaneous heater and separate storage tank for the same duty.
Is built to eliminate strains on all parts and piping.

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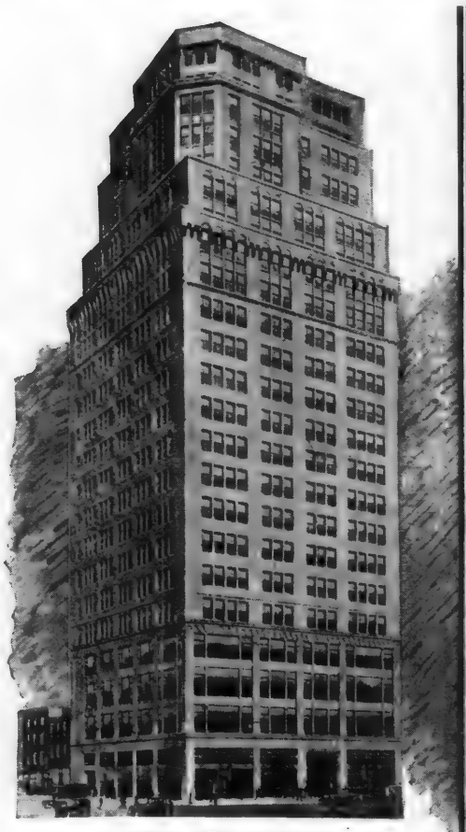
Dept. H., 285 Madison Ave., N. Y.
Please send me, without obligation, full information on the G-R Instanta Storage Heater.

H. & V. M. 6-26.



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39TH ST. AND 8TH AVE., NEW YORK

Gronenberg & Leuchtag
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The Brains Behind This Building Had Positive Proof of the Worth of

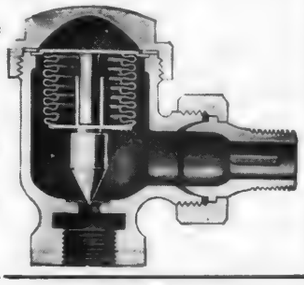
SARCO Radiator Traps

The architects and engineers who specified 790 Sarco Radiator Traps for this big, important building, started years ago by using these traps in one small building. The Sarco Trap made good; so good, in fact, that since that time the "Sarco" has been specified in other high class buildings they have designed.

Don't you owe it to yourself to find out about this radiator trap that has won the unqualified confidence of shrewd, far-seeing architects and engineers in all parts of the country?

Let us send you the names of leading architects and engineers who have installed the Sarco in hundreds of the most modern buildings and ask what they think of this trap.

Ask for our list of installations and Catalog No. P-130



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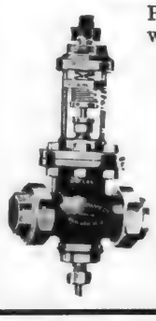

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- ☐ Reducing Valves
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REGULATING VALVES FOR EVERY SERVICE

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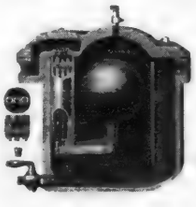

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"EMERGENCY" STEAM TRAPS

High Pressure

Handle light loads without wire-drawing, heavy loads without choking. Have very large capacity for emergencies. Require no change of valves from 0 lbs. to 200 lbs. pressure.

Ask for Bulletin No. 201

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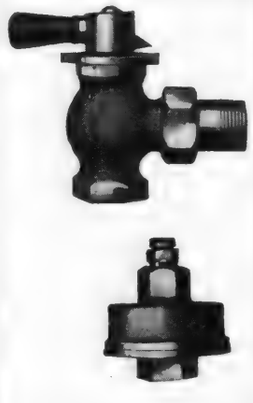
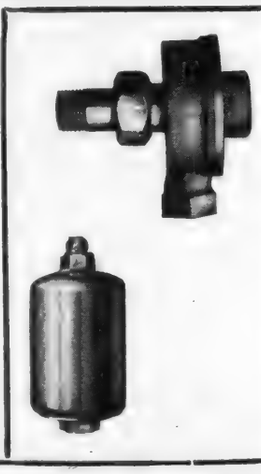


A Dependable Line of Heating Specialties

Stay-Rite Heating Specialties are dependable because they are made right and in strict accordance with heating requirements. They have long since passed the experimental stage. And over many heating seasons they have justified the confidence of their owners and proved the high efficiency of the Stay-Rite Line.

Write for literature and prices

The Ideal Heating Equipment Co.
1250 West 4th Street CLEVELAND, OHIO



Note how mechanically it is installed:

Set base drain in place.

Wedge pipe supports between sections of base drain.

Install pipes and pipe covering.

Set bottom conduit halves on base drain.

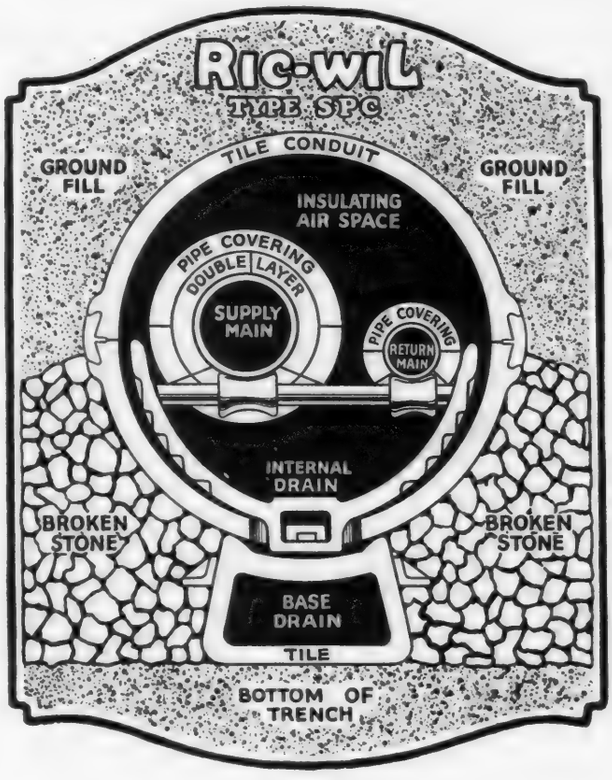
Bank with broken stone.

Apply top conduit halves.

Cement Loc-liP Joints.

Back-fill.

It sounds practical—and it actually is.



And it's practical on the Job

RIC-WIL Conduit is practical—as practical as the steam pipes it insulates and protects. Ask the men who have installed it—and there are thousands of them.

They've tested Ric-wiL in the field, on the job. They know that, even the first time they install it, it goes in easily, smoothly, quickly, with the machine-like precision we promise for it.

And when the job's in—practical efficiency. Drainage is immediate and unfailing; always the pipes are supported where they belong in the conduit; and there is efficient dryness permanently because of the practical water-tight Loc-liP Joints.

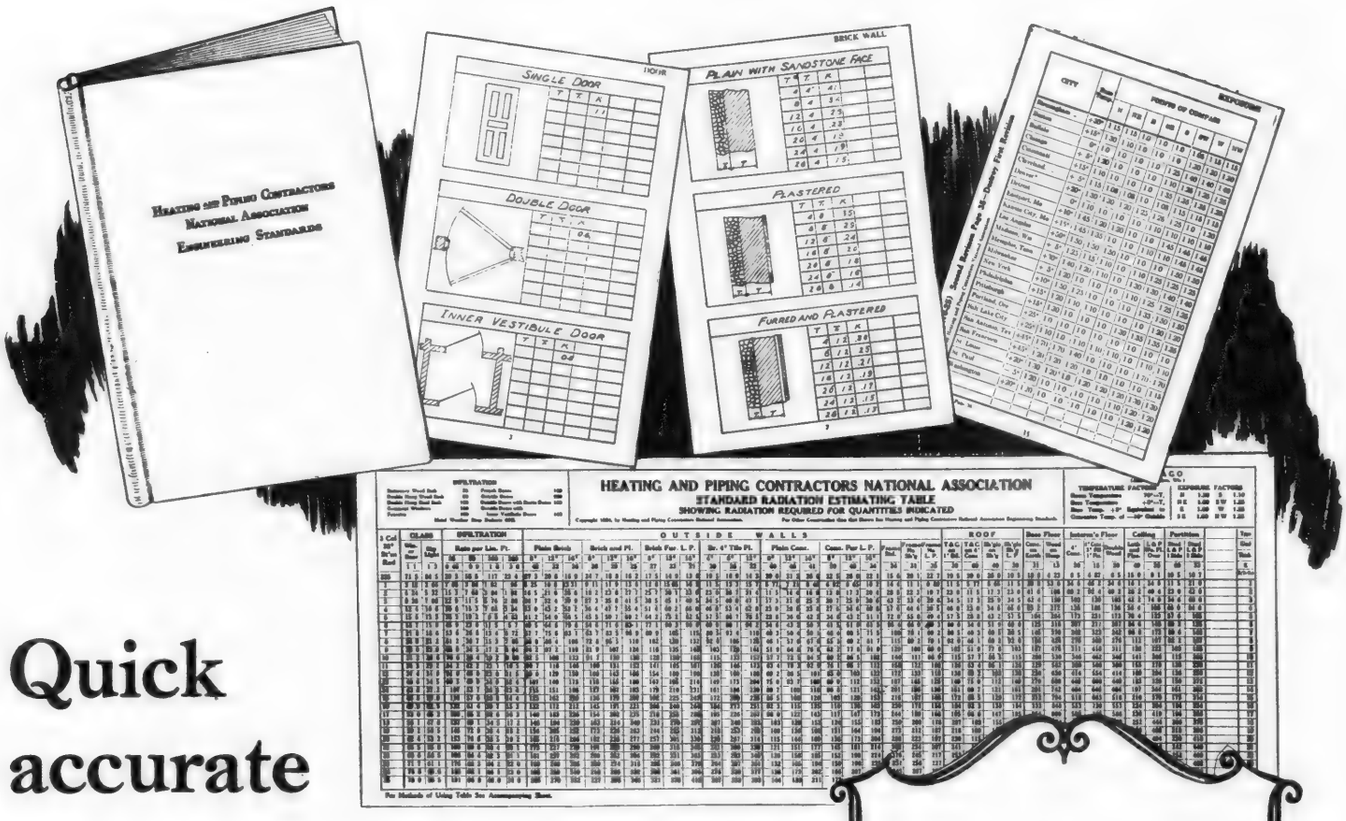
When you specify Ric-wiL, sound practical engineering guarantees your client the efficiency that makes his investment profitable.

THE RIC-WIL COMPANY, CLEVELAND, OHIO

Figure Installed Costs!
Not the cost of materials only but the final installed cost is what interests you. Here's a comparison of Ric-wiL and ordinary conduit, based on experience. It covers all items that concern conduit. Materials include conduit at job, broken stone, cement, sand. Labor, includes, complete work of trenching and installing. Piping, manholes, anchors, not included.

RIC-WIL

UNDERGROUND CONDUIT



Quick accurate ESTIMATION of RADIATION

A simple fool-proof method is available for every heating contractor.

A wealth of information on radiation has been compiled by a group of America's foremost heating engineers. Over $100,000 has been spent in time and money by the Heating and Piping Contractors National Association so heating contractors may have a reliable guide, so time may be saved, so radiation may be **accurately** estimated. Contractors find this book worth many times its weight in gold. 151 constants are given for various types of construction and thickness of wall, infiltration factors, exposure factors, and other information needed to figure radiation quickly and correctly.

The complete work, in a loose leaf binder, entitled "Engineering Standards" may be obtained by readers of this magazine for $5.00. Standard Radiation Estimating Tables for any one of the twenty-four cities listed in the panel at the right is given with each book. Please signify the city desired. If your city is not listed, request chart for city nearest your locality.

Fill in the coupon and order today. A heavy demand necessitated a reprint of this book, which reprint is now available.

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Date.....

Send me copy of "Engineering Standards" complete with all data necessary to correctly estimate radiation in any type of building. Also include Radiation Table for City of.....

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Enclosed find $5.00 to cover cost and postage.

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The Heating and Piping Contractors National Association

—1926 is the 37th year of this nation-wide organization of heating and piping contractors.

America's leaders in heating and piping work are numbered among its members.

Its book on radiation compiled by the Committee on Standardization is a notable example of the beneficial work carried on by the Heating and Piping Contractors National Association.

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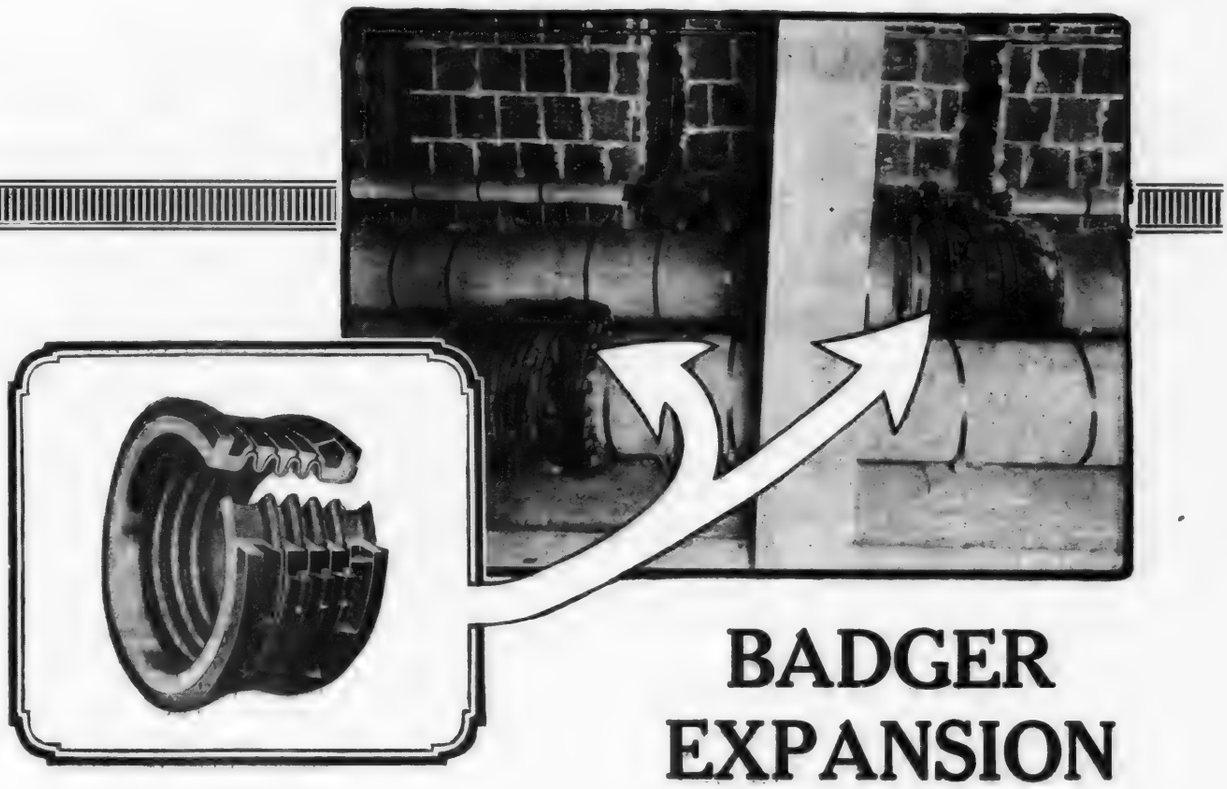

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Install them and forget them

Badger expansion joints are life-time insurance against interrupted pipe line service. Only one premium is paid for this protection—the first.

And it's nobody's job to keep them in service. Their one-piece construction of uniform thickness and strength eliminates packing and attention. No maintenance doesn't mean low maintenance. It means just one thing—that Badger Expansion Joints, installed as easily as any pipe line flanged joint, lose nothing in effectiveness by being neglected. It means that Badger Expansion Joints are designed to be installed and then forgotten.

Then think what this means when piping is laid in tunnels. Badger Expansion Joints are leak proof—no shut downs to clear the tunnel of steam to repack or repair—no financial loss from interrupted service—no personal danger.

Badger Expansion Joints insure protection at no upkeep cost. Safety features of design are described in our Bulletin. Write for it today—there's no obligation.

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Fan.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa.

Pressure.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Turbine.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.

BLOW OFF BASINS.
Cast Iron.
Inland Iron Works, Joliet, Ill.

BOILER CEMENT.
Johns-Manville, Inc., New York.

BOILER COMPOUNDS
Vinco Company, Inc., New York.

BOILERS.
Down-Draft.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
General Boilers Co., Waukegan, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Molby Boiler Co., New York.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works, Titusville, Pa.
Universal Smokeless Boiler Co., Ravenna, Ohio.

Gas Fired
American Gas Products Corp., New York.
Evenheat Mfg. Co., Chicago, Ill.
Ofeldt Gas Boiler Sales Corp, Chicago, Ill.

Heating.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Burnham Boiler Corp., Irvington, N. Y.
Continental Heater Corp., Dunkirk, N. Y.
Evenheat Mfg. Co., Chicago, Ill.
Frost Mfg. Co., Chicago, Ill.
General Boilers Co., Waukegan, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Gurney Heater Mfg. Co., Boston, Mass.
Heggie Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Lebanon Boiler Works, Lebanon, Pa.
Molby Boiler Co., New York.
National Radiator Co., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Niagara Radiator & Boiler Co., North Tonawanda, N. Y.
Page Boiler Co., Wm. H., New York
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York.
Standard Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., Newark, N. J.
Titusville Iron Works, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Universal Smokeless Boiler Co., Ravenna, Ohio.
Utica Heater Co., Utica, N. Y.
Weil-McLain Co., Chicago, Ill.

Power.
Frost Mfg. Co., Chicago, Ill.
Heggie Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Sarco Co., New York.

COILS, PIPE.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Pecco, Inc., St. Louis, Mo.
Whitlock Coil Pipe Co., Hartford, Conn.

Air.
New York Blower Co., Chicago, Ill.

CONCRETE INSERTS
Frank Radiator Bracket Co., Chicago, Ill.
Little Giant Mfg. Co., Minneapolis, Minn.

CONDENSERS.
Alberger Heater Co., Buffalo, N. Y.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER.
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Frank Heating & Engineering Co., O. E., Buffalo, N. Y.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.
Wyckoff & Son Co., A., Elmira, N. Y.

COOLERS.
Oil.
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING PLANTS & PONDS
Spray Engineering Co., Boston, Mass.

COOLING TOWERS.
Badger & Sons Co., E. B., Boston, Mass.
Cooling Tower Co., New York.

COPPER BOILERS.
Badger & Sons Co., E. B., Boston, Mass.
Dahlquist Mfg. Co., Boston, Mass.

COPPER KETTLES.
Badger & Sons Co., E. B., Boston, Mass.
Dahlquist Mfg. Co., Boston, Mass.

COVERING PIPE.
American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
Johns-Manville Inc., New York.
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A, Elmira, N. Y.

DAMPERS, DUCT.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
York Heating & Ventilating Co., Philadelphia, Pa

DEHUMIDIFYING APPARATUS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Engineering Corp., Newark, N. J.
Cooling Tower Co., New York.
Fleisher Co., Inc., W. L., New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

DISTILLERS, (Water).
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co. Inc., Buffalo, N. Y.

DRAFT APPLIANCES.
Wolff Coal Saver Co., Chicago, Ill.

DRYING SYSTEMS.
(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa

DUST COLLECTORS.
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F. Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa

ENGINES.
Steam, Automatic.
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York
Sturtevant Co., B. F., Hyde Park, Mass.

EQUALIZING LOOPS.
Hoffman Specialty Co., New York.

EVAPORATORS.
Boiler Feed Make-Up.
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Co., New York.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

YOUNG

CENTRIFUGAL VACUUM PRESSURE PUMPS

CENTRIFUGAL VACUUM AND BOILER FEED

Supplied in Standard Units of Seven Capacities

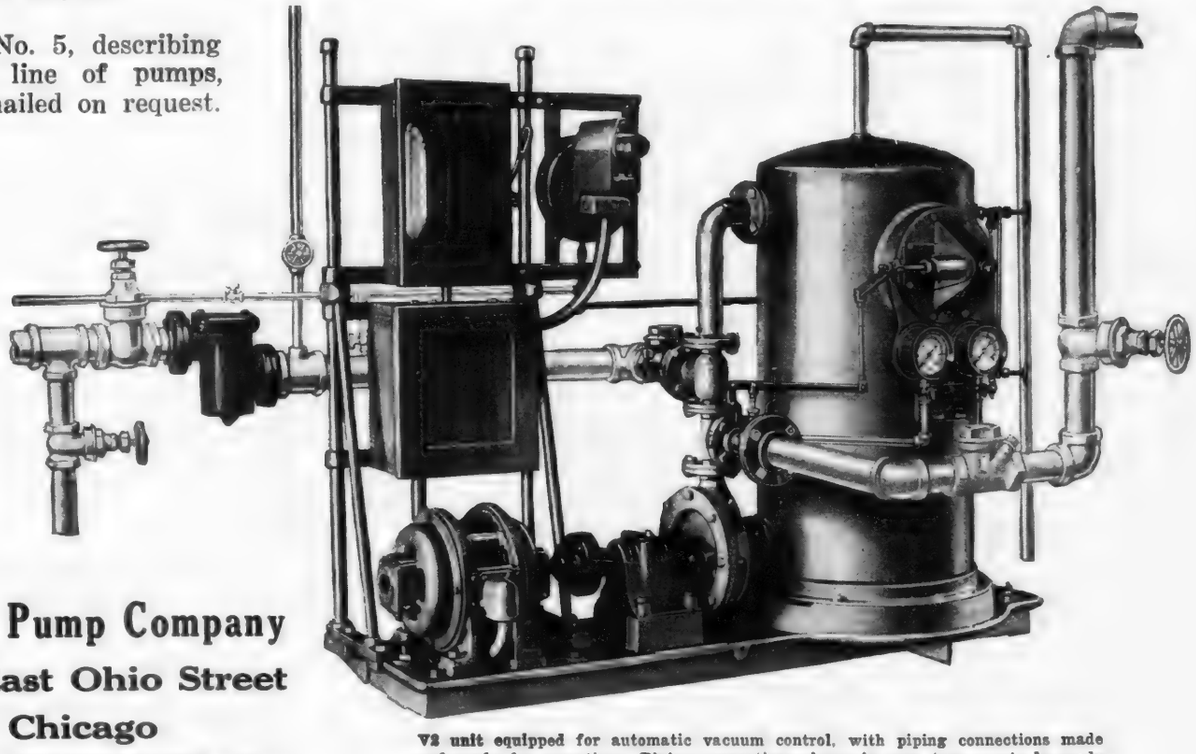
PUMPS

Meet A. S. M. E. Code Safety Specifications

The A. S. M. E. code specifying a maximum safety valve pressure of fifteen pounds for steam heating systems is met by the ability of the Young Pump to discharge against twenty pounds pressure at the pump, thus giving ample boiler protection.

This is a factor of vital importance when selecting a centrifugal vacuum or boiler feed pump, and it should be given careful consideration to insure safe, satisfactory working capacity in the pump chosen. The Young Pump has numerous other advantages. Its power consumption is remarkably low, never exceeding a certain maximum determined by the capacity of the pump. The generously large overload capacity of the motor eliminates entirely any danger of the pump stalling, whatever the condensation load may be.

Bulletin No. 5, describing complete line of pumps, will be mailed on request.



V2 unit equipped for automatic vacuum control, with piping connections made and ready for operation. Piping connections shown in gray tone are to be made by contractor. Suction strainer and check valve at inlet of pump are furnished with unit, as well as companion flanges, bolts and gaskets.

Young Pump Company
450 East Ohio Street
Chicago
Factory: MICHIGAN CITY, IND.

YOUNG PUMP COMPANY

ENGINEERS' SPECIFICATION INDEX (Continued)

EXHAUST HEADS.
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass
Wright-Austin Co., Detroit, Mich.

EXHAUST SYSTEMS.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N Y.
Ilg Electric Ventilating Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Co., Philadelphia, Pa

EXPANSION JOINTS.
American District Steam Co., No. Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Dahlquist Mfg. Co., Boston, Mass.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Howard Iron Works, Buffalo, N. Y.
Illinois Engineering Co., Chicago, Ill.
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.
Wheeler Condenser & Engineering Co., Carteret, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, EXHAUST.
Amercan Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa

FEEDERS
Boiler
Kieley & Mueller, Inc., New York.
McDonnell & Miller, Chicago, Ill.

FILTERS, (Aerating).
Davis Engineering Corp., New York.
Griscom-Russell Co., New York.

Feed-Water.
Davis Engineering Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Clow and Sons, Jas. B., Chicago, Ill.
Grinnell Company, Providence, R. I.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster & Co., Warren, Camden, N. J.

GAUGES.
Altitude
Pierce, Butler & Pierce Mfg. Co., New York.

Draft.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Hydraulic.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

Ounce Graduated.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.

Pressure.
American Dist. Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Co., New York.
Webster & Co., Warren, Camden, N. J.
Bishop & Babcock Co., Cleveland, Ohio.

Vacuum.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Webster & Co., Warren, Camden, N. J.

Vacuum (Compound).
Cashin Co., W. D., Boston, Mass.
Pierce, Butler & Pierce Mfg. Co., New York.

Water.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenburg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bristol Co., Waterbury, Conn.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Cooling Tower Co., New York.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

GOVERNORS, (Pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.
Westinghouse Elec. &. Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co., Detroit, Mich.

GRATES
Dumping
Pyramid Iron Products Co., New York.

Rocking
Pyramid Iron Products Co., New York.

Shaking
Pyramid Iron Products Co., New York.

Shaking and Dumping
Pyramid Iron Products Co., New York.

Shaking, Circular
Pyramid Iron Products Co., New York.

Stationary
Pyramid Iron Products Co., New York.

HEAT CABINETS
Trane Co., LaCross, Wis.

HEATERS.
Domestic Water.
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Badger & Sons Co., E. B., Boston, Mass.
Burnham Boiler Corp., Irvington, N. Y.
Dahlquist Mfg. Co., Boston, Mass.
Davis Engineering Co., New York.
Excelso Specialty Works, Buffalo, N. Y.
Frank Heating & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Standard Heater Co., Williamsport, Pa.
Thermal Appliance Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

Electrical Unit
Ilg Electric Ventilating Co., Chicago, Ill.

Feed Water, (Closed).
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Co., New York.
Frank Heating & Engineering Co., O. E., Buffalo, N. Y.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Open).
Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Fuel-oil.
Alberger Heater Co., Buffalo, N. Y.
American Blower Co., Detroit, Mich.
Davis Engineering Corp., New York.
Drying Systems, Inc., Chicago, Ill.
Griscom-Russell Co., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Inc., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

Air, Fan System.
Aerofin Corporation, Newark, N. J.
American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Drying Systems, Inc., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

Magazine Feed
Standard Heater Co., Williamsport, Pa.

Portable Unit Air.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Mueller Furnace Co., L. J., Milwaukee, Wis.
Pecco Incorporated, St. Louis, Mo.
Skinner Bros. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa
(See also Ventilators, Portable Unit.)

HEATING SYSTEMS.
"Gasteam".
James B. Clow & Sons, Chicago, Ill.

Vacuum.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Standard Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind
Webster & Co., Warren, Camden, N. J.

Vapor.
American District Steam Co., No. Tonawanda N. Y.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Grinnell Company, Providence, R. I.
Haines & Co., Wm. S., Philadelphia, Pa.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
Nelson Corporation, Herman, Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Standard Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis
Trane & Co., La Crosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

Water.
Grinnell Company, Providence, R. I.
Patterson-Kelley Co., New York.
Standard Heater Co., Williamsport, Pa.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J
Drying Systems, Inc., Chicago, Ill.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.

HUMIDITY CONTROL.
American Blower Co., Detroit, Mich.
Atlas Valve Co., Newark, N. J.
Bayley Mfg. Co., Milwaukee, Wis.
Carrier Air Conditioning Co., of America, Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Drying Systems, Inc., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Grinnell Company, Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.

INSTRUMENTS
Electric Measuring.
Bristol Co., Waterbury, Conn.
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

Indicating and Recording.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Bailey Meter Co., Cleveland, O.
Foxboro Co., Inc., The Foxboro, Mass.

YEOMANS

YEOMANS PUMPS GIVE YEOMAN SERVICE

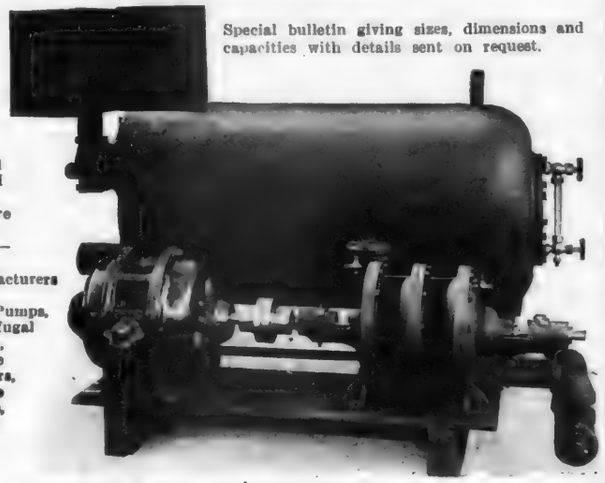
CONDENSATION PUMPS

AUTOMATIC
ELECTRIC
NOISELESS
RUGGED

The mark of Dependability

Built for all pressure and capacity requirements

Special bulletin giving sizes, dimensions and capacities with details sent on request.



Special Type H High Pressure Unit.

Also manufacturers of Bilge Pumps, Centrifugal Pumps, Sewage Ejectors, Sewage Pumps, etc.

YEOMANS BROTHERS CO.
1421 Dayton St. Representatives in all principal cities. Chicago, Ill.

DEPENDABILITY

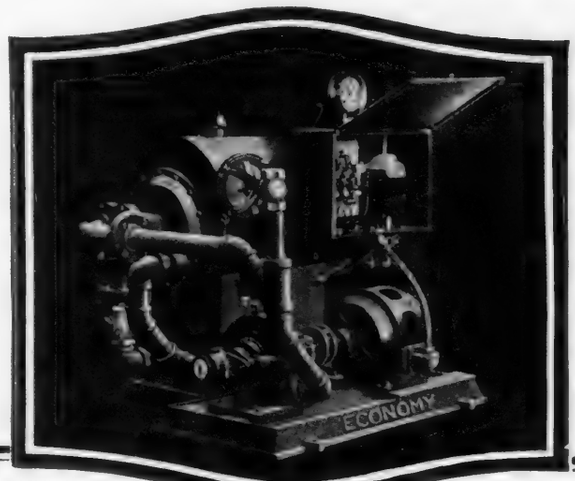
CENTRAL STATION STEAM CO.
2912 East Woodbridge St.
DETROIT, MICHIGAN

MANUFACTURERS OF
Cadillac Condensation Meters
Detroit Feed Water Meters

Packingless Expansion Joints and other special fittings for underground steam distribution mains.

CORRECTLY DESIGNED
Cast Iron Blow Off Basins
also
APPROVED GARAGE BASIN EQUIPMENT

INLAND IRON WORKS
99-111 McDonough Street JOLIET, ILL.



Type C. V. Fig. 2234—Single Model Vacuum Pumps

DEPENDABILITY

This is an essential requirement of all apparatus entering into the equipment of every worth while project.

Economy Centrifugal Vacuum Pumps

embody every requisite of high class equipment. They are well motored with ample reserve power. They never burn out, consequently shut downs are avoided.

They have ample air, water and pressure capacity.

They have longer life than other types.

They maintain their efficiencies.

They are scientifically designed.

They have the best thought of competent hydraulic and heating engineers built into them.

They require less attention and upkeep than other types.

They reduce noise in radiators and piping.

They operate quietly.

They use no more power than other pumps that do the same work.

They are guaranteed for performance and quality.

Representatives in Every Large City

Economy Pumping Machinery Co.
71-122 North Curtis St. CHICAGO

ENGINEERS' SPECIFICATION INDEX (Continued)

Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., New York
Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Armstrong Cork & Insulation Co., Pittsburgh, Pa.
Hornung, J. C., Chicago, Ill.
Johns-Manville, Inc., New York.
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Universal Gypsum Co., Chicago, Ill.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.
Hornung, J. C., Chicago, Ill.
Pearce & Co., W. H., Chicago, Ill.

Feed Water.

Central Station Steam Co., Detroit, Mich.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Flow

American District Steam Co., North Tonawanda, N. Y.
Spray Engineering Co., Boston, Mass.

Pitot Tube.

American Blower Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Foxboro Co., Inc., The Foxboro, Mass.

MOTORS (Electric).

Century Electric Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

NOZZLES, SPRAY

American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Manufacturing Co., Milwaukee, Wis.
Carrier Air Conditioning Co. of America, Buffalo, N. Y.
Carrier Engineering Co., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower Co., New York
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Mass.

OIL BURNERS

American Nokol Co., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Caloroil Burner Corp., New York
Chalmers Oil Burner Co., Minneapolis, Minn.
Combustion Fuel Oil Burner Co., Milwaukee, Wis.
Drying Systems, Inc., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Home Appliance Corp., St. Louis, Mo.
Johnson Co., S. T., Oakland, Cal.
Marr Oil Heat Machine Cor., Minneapolis, Minn.
May Oil Burner Corp., Baltimore, Md.
Nu-Way Corporation, Rock Island, Ill.
Rayfield Mfg. Co., Chicago, Ill.
Wilde Co., W. B., Peoria, Ill.
Winslow Boiler & Engineering Co., Chicago, Ill.

OIL BURNER ACCESSORIES

Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Monroe Machine Tool Co., Chicago, Ill.
Webster Electric Co., Racine, Wis.

OZONE APPARATUS.

Air Conditioning & Engineering Co., St. Louis, Mo.
United States Ozone Co., Scottdale, Pa.

PIPE.

Cast Iron.

Clow & Sons, Jas. B., Chicago, Ill.

Steel.

National Tube Co., Pittsburgh, Pa.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Grinnell Company, Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (Wood).

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.

PIPE, POWER.

Grinnell Company, Providence, R. I.

PUMPS.

Centrifugal.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Nash Engineering Co., So. Norwalk, Conn.
Wheeler Condenser & Engineering Co., Carteret, N. J.
Yoemans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Du Moin Pump Sales Co., Des Moines, Iowa.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

RADIATOR HANGERS.

Frank Radiator Bracket Co., Chicago, Ill.
Gloeckle, Jr., A. F., Rochester, N. Y.
Grinnell Company, Providence, R. I.
Little Giant Mfg. Co., Minneapolis, Minn.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Company, St. Paul, Minn.
Pierce, Butler & Pierce Mfg. Co., New York.

RADIATORS.

"Gasteam."

James B. Clow & Sons, Chicago, Ill.

"Gaswater."

Clow & Sons, Jas. B., Chicago, Ill.

RADIATORS, STEAM AND WATER.

Aerofin Corp., Newark, N. J.
American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
National Radiator Co., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Co., New York.
Richmond Radiator Co., New York
Standard Heater Co., Williamsport, Pa.
United States Radiator Corp., Detroit, Mich.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, Ohio.
Kieley & Mueller, Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

Damper.

American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Honeywell Heating Specialties Co., Wabash, Indiana.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
Nelson Corporation, Herman, Moline, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Thrush & Co., H. A., Peru, Ind.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Honeywell Heating Specialties Co., Wabash, Indiana.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Stickle Steam Specialties Co., Indiapapolis, Ind
Thrush & Co., H. A., Peru, Ind.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Carrier Engineering Corporation, Newark, N. J
Foxboro Co., Inc., The Foxboro, Mass.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn,
Honeywell Heating Specialties Co., Wabash, Indiana.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
White Mfg. Co., St. Paul, Minn.

SEPARATORS.

Oil.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Stickle Steam Specialties Co., Indianapolis, Ind
Wright-Austin Co., Detroit, Mich.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, Ohio.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Stickle Steam Specialties Co., Indianapolis, Ind
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SPRAY COOLING SYSTEMS.

Badger & Sons Co., E. B., Boston, Mass.
Bayley Mfg. Co., Milwaukee, Wis.
Cooling Tower Co., New York.
Massachusetts Blower Co., Watertown, Mass
Seymour, James M., Newark, N. J.

SPRAY NOZZLES

(See Nozzles, Spray)

STOKERS

CombustiKator Co., Chicago, Ill.
Domestic Stoker Co., New York.

STRAINERS.

Oil.

Griscom-Russell Co., New York.
Kieley & Mueller, Inc., New York.
Monroe Machine Tool Co., Chicago, Ill.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y

Steam.

American Dist. Steam Co., No. Tonawanda, N Y.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regular Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co, Milwaukee, Wis
Wright-Austin Co., Detroit, Mich.

Water.

American Dist. Steam Co., No. Tonawanda, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Ross Heater & Mfg. Co., Inc., Buffalo, N. Y
Sarco Co., New York.
Spray Engineering Co., Boston, Mass.

THERMOMETERS.

(Recording and Indicating).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., Waterbury, Conn.
Foxboro Co., Inc., The Foxboro, Mass.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

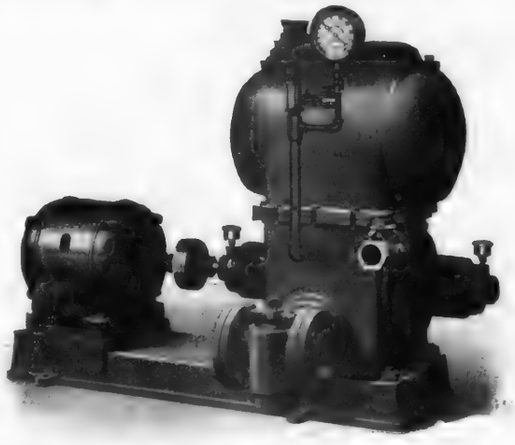
Water.

Marsh & Co., Jas. P., Chicago, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.

THERMOSTATS.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, Ohio.
Fulton Co., Knoxville, Tenn.
Gold Car Heating & Lighting Co., Brooklyn.

SKIDMORE



The New Type "B"

THE Skidmore Hydro Turbine Vacuum and Boiler Feed Pump is now entering its fifth year.

Units that have been in service four heating seasons show the same efficiency that was shown when installed.

The new type offered retains all the advantages of those now in service, the change in design being in the casing to secure a more compact and sturdy unit.

All parts are of high grade cast iron or bronze, accurately machined.

There are no close clearances on moving parts and no piping is required to set the unit.

A self-contained unit all on one base.

Built in seven sizes for 10 to 60 lbs. pressure to handle 5,000, 8,000, 16,000, 26,000, 40,000, 65,000 and 100,000 sq. ft. of radiation for continuous service or with automatic control

SKIDMORE CORPORATION

General Offices and Factory

1535 Dayton St. CHICAGO, U. S. A.

THE perfection of the Chicago Pump Company's Vertical Condensation Pump and Receiver is the answer to a problem that has, for many years, confronted the heating industry. This splendid outfit has been especially designed for duty where return lines from heating systems come back below the floor level.

Pitting a horizontal pumping unit (which has many obectionable features) or using makeshift outfits to meet these conditions is no longer necessary—the Vertical Condensation Pump may be installed *right in the ground.*

1. A very limited amount of floor space is required.
2. The outfit is self-contained and is shipped as a unit.
3. All flanges are machine finished and assembled to prevent steam leaks. Special oil-less bearings are used that will stand in hot water for several years without lubrication.
4. Our special improved float mechanism is guaranteed not to leak, or stick in stuffing boxes.

Units may be had for capacities up to 50,000 square feet of direct radiation and for boiler pressures up to 25 lbs. Bulletin 133 fully describes this splendid outfit.

Chicago Pump Company

Manufacturers of Quality Centrifugal Pumps for Every Service

2325 Wolfram St. Chicago, Ill.

ENGINEERS' SPECIFICATION INDEX (Continued)

Honeywell Heating Specialties Co., Wabash, Indiana.
Johnson Service Co., Milwaukee, Wis.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.
Thrush & Co., H. A., Peru, Ind.
White Mfg. Co., St. Paul, Minn.

TRAPS.

Radiator.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D. Boston, Mass.
Dunham, C. A., Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Ideal Heating Equipment Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mouat Vapor Heating Co., Cleveland, O.
Nelson Corporation, Herman, Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

Return.

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago Ill.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat Vapor Heating Co., Cleveland, O.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Simplex Heating Specialty Co., Inc., Lynchburgh, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

Steam.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Davis Engineering Co., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville, Inc., New York.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Pearce & Co., W. H., Chicago, Ill.
Sarco Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Trane Co., La Crosse, Wis.
Wright-Austin Co., Detroit, Mich.

Vacuum.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Pearce & Co., W. H., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co. East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Sturtevant Co., B. F., Hyde Park, Mass.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, P. C., Chicago, Ill.
Johns-Manville, Inc., New York
Pearce & Co., W. H., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son, A., Elmira, N Y

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Spencer Turbine Co., Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Mass.

VALVES.

Air (Automatic).

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Fulton Co., Knoxville, Tenn.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Pierce, Butler & Pierce Corp., New York.

Air Relief.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
O-E Specialty Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Back Pressure.

Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Balanced.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.
Stickle Steam Specialties Co., Indianapolis, Ind.

Blow-off.

Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

Check.

Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Float.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller Co., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Stickle Steam Specialties Co., Indianapolis, Ind.

Gate.

American District Steam Co., No. Tonawanda, N. Y.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Scott Valve Mfg. Co., Detroit, Mich.

Globe, Angle and Cross.

Commonwealth Brass Corp., Detroit, Mich.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Marsh Valve Co., Erie, Pa.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Corp., New York.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Scott Valve Mfg. Co., Detroit, Mich.

Hydraulic-Operating.

Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.

Non-Return.

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Grinnell Company, Providence, R. I.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.

Radiator.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, Ohio.
Commonwealth Brass Corporation, Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
Fulton Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Honeywell Heating Specialties Co., Wabash, Indiana.
Ideal Heating Equip. Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Trane Co., La Crosse, Wis.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Stickle Steam Specialties Co., Indianapolis, Ind.
Webster & Co., Warren, Camden, N. J.

Reducing.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.

Regulating.

American District Steam Co., No. Tonawanda N. Y.
Fulton Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

Relief (Water).

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., Cincinnati, Ohio.

Safety.

American District Steam Co., No. Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., Cincinnati, O.

Stop and Check.

(See Valves, Non Return).

VENTILATING HEATERS

Portable Unit.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, Ohio.
Mueller Furnace Co., L. J., Milwaukee, Wis.
Nelson Corporation, Herman, Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilating Co., New York.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Mass.
York Heating & Ventilating Co., Philadelphia, Pa.

(See also Heaters, Portable Unit Air).

VENTILATING SYSTEMS

Air Conditioning & Engineering Co., St. Louis, Mo.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass
Nelson Corporation, Herman, Moline, Ill.
Nesbitt, John J., Inc., Atlantic City, N. J.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilating Co., New York.
Seymour, James M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa

VENTILATORS.

Aeolus Dickinson Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Ilg Electric Ventilating Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Seymour, James M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Mass.
L. J. Wing Mfg. Co., New York.
York Heating & Ventilating Co., Philadelphia, Pa

Mushroom.

Aeolus Dickinson Co., Chicago, Ill.
Knowles Mushroom Ventilator Co., New York
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Mass.
Ventilating Products Co., Chicago, Ill.

WEATHER STRIPS.

Metal.

Athey Company, Chicago, Ill.
Chamberlin Metal Weather Strip Co., Detroit, Mich.
Higgin Manufacturing Co., Newport, Ky.

This is the new "Buffalo" SUMP PUMP

No matter what pumps you've used in the past, this new Buffalo Sump Pump merits your consideration.

In addition to high efficiency and compact, sturdy, trouble-proof construction these pumps are non-clogging.

Production economies enable us to sell them at very low prices.

Write for Bulletin 9633.

Buffalo Steam Pump Co.
480 BROADWAY BUFFALO, N. Y.

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

For Low Pressure Heating Systems

American-Marsh Condensation Pumps

In every instance where the installation is American-Marsh Pumps, there you will find satisfactory service.

The centrifugal automatic Boiler Feed Pump and Receiver is the practical pump for low pressure heating systems, where the condensation flows by gravity into the receiving tank. Made in vertical and horizontal types, for boiler pressure up to fifty pounds.

Get the installation that suits your requirements. Write for Bulletin.

American Steam Pump Company
Battle Creek, Michigan

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Selected!

The new Barclay Vesey Telephone Building in New York City was recently completed.

This building of necessity had to be adequately equipped with modern conveniences. At the same time efficiency and economy were considered.

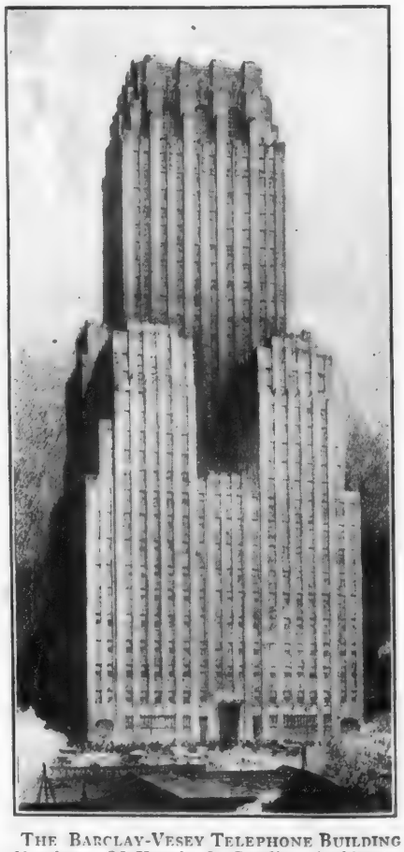
To meet the cleaning requirements, the SPENCER CENTRAL CLEANING SYSTEM was finally selected and installed.

Large and small buildings and dwellings are today SPENCER-CLEANED.

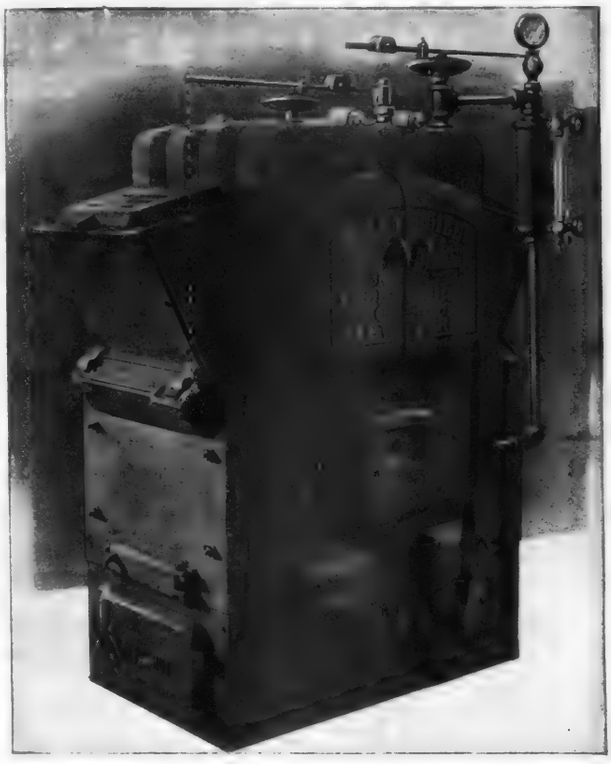
The

SPENCER TURBINE COMPANY

HARTFORD, CONN.



THE BARCLAY-VESEY TELEPHONE BUILDING
Voorhees, McKenzie & Gmelin, *Architects*



Low Pressure Heating with low-priced No. 1 Buckwheat

—and it saves hours of labor

HERE you see a Molby downdraft-crossdraft boiler with *two* magazines, one on each side. These "hoppers" need coaling only every 12 to 14 hours in severe winter weather. In mild weather operation of one side of the boiler is sufficient.

No blowers. No motors. No electricity. Nothing to get out of order. All cast iron sectional construction.

For steam, vapor and hot water heating *and for hot water supply.*

Coal bills cut as much as 50% in homes and large buildings. Hundreds giving perfect satisfaction. Steam and vapor 500 to 7750 sq. ft. Hot water 850 to 12925 sq. ft. Ask for catalog and trade prices.

The MOLBY HEATING BOILER

[MAGAZINE-FEED]

burns No. 1 Buckwheat

MOLBY BOILER COMPANY, *Incorporated*

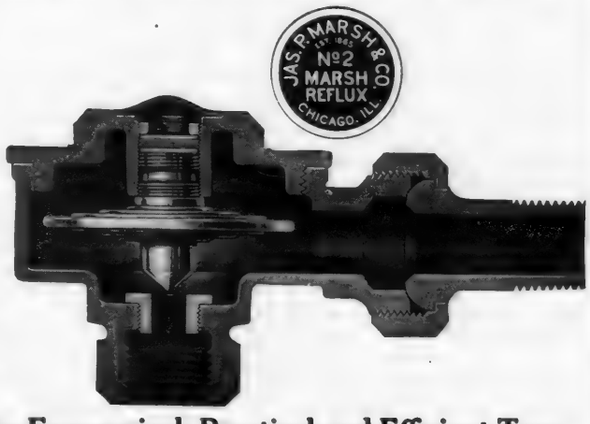
Subsidiary of The Universal Pipe and Radiator Company

NEW YORK: 41 East 42d St. LANSDALE, PA.: 41 Central Ave.

MARSH REFLUX THERMOSTATIC RADIATOR TRAPS

GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



The Most Economical, Practical and Efficient Trap for the Average Sized Unit

Marsh Reflux Traps assure full efficiency of Radiator Coil and System.

Automatically discharge air and the water of condensation as fast as it is formed.

The Trap closes the instant steam or vapor strikes the thermostatic diaphragm. Vapor or steam cannot pass through the Trap; therefore every atom of heat is given off in the radiator or coil.

Just one movable part—nothing loose to rattle, chatter or make a noise.

Neat in appearance, handsomely finished and heavily nickel-plated.

The Economical, Practical and Efficient Trap for Both Small and Large Units

Marsh Reflux Traps are all-metal construction including heavy cast brass body, handsomely nickel-plated and with extra heavy special tail piece.

The one movable part—a genuine phosphor bronze non-collapsible Thermostatic Diaphragm—contains the combination of volatile fluids so balanced as to, at all times, distinguish between air and water of condensation and vapor or steam. So corrugated and constructed to eliminate the slightest possibility of rupture from alternate expansion and contraction.

JAS P. MARSH & CO. 114-124 So. Clinton St. ESTABLISHED 1865 Chicago

61 YEARS CONTINUOUS EXPERIENCE IN MANUFACTURE OF STEAM SPECIALTIES

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents—Indicating and Recording Gauges

Agents for Great Britain and Ireland: Ohatterton & Co., 30 Fetter Lane, E. C. 4, London.
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario.

A Remarkable Comparison

Left: Annex Apts.
Right: Carolyn Apts.
Whitman & Wolfson, 415 National Building, Minneapolis, Builders and Owners.

This

building was heated by one No. 618 Pacific Updraft Smokeless Boiler (6500' rated capacity). Between October 9, 1925, and March 26, 1926, the Pacific boiler burned 122 tons of screenings at $7.60 per ton, total $927.20.

This

building under *exactly identical* conditions was heated by an ordinary steel firebox return tubular down draft boiler, same rated capacity. During the same period, it burned 154 tons of lump coal at $8.40 per ton, total $1293.60.

The Net Saving

in the Pacific Heated Building was $366.40 or over 28%

Two buildings side by side—same size, same builders, same plans. Even the same fireman. Identical heating conditions. Yet the Pacific boiler showed remarkable fuel saving over the other boiler. There is only one answer—superior Pacific construction features. Write us for complete information.

GENERAL BOILERS CO.
WAUKEGAN, ILLINOIS
Branch Offices in Principal Cities

TRADE MARK REG. U.S. PAT. OFF.
STEEL HEATING BOILERS
PACIFIC
WAUKEGAN, ILLINOIS

PACIFIC

STEEL HEATING BOILERS

KEWANEE

Steel Boilers

Size is important

You can make a boiler do the work of a larger one by "pushing" it. *But it is uneconomical to do so.* The more a boiler is pushed the less heat you get from each pound of your fuel.

The generous size of Kewanee Boilers makes this costly "rapid firing" unnecessary, because they will produce the steam guaranteed by their rated capacities without being pushed.

Yes — size is important. It affects the pocket book of every building owner.

KEWANEE BOILER COMPANY KEWANEE, ILLINOIS

		BRANCHES			
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Birmingham, Ala.	Cleveland, Ohio			Philadelphia, Pa.	Seattle, Wash.
Boston, Mass.	Dallas, Tex.	El Paso, Texas	Los Angeles, Calif.	Pittsburgh, Pa.	Spokane, Wash.
Charlotte, N. C.	Denver, Colo.	Grand Rapids, Mich.	Memphis, Tenn.	St. Louis, Mo.	Toledo, Ohio
Chattanooga, Tenn.	Des Moines, Iowa	Indianapolis, Ind.	Milwaukee, Wis.	Salt Lake City, Utah	Toronto, Ont., Can.
Chicago, Ill.	Detroit, Mich.	Kansas City, Mo.	Minneapolis, Minn.	San Antonio, Texas	New York City, N. Y.

STEEL HEATING BOILERS, RADIATORS, WATER HEATERS, TANKS AND WATER HEATING GARBAGE BURNERS

"Old Friends"

Gurney

900 Series
Steam and Water

Compact, simple in construction.
Large prime heating surfaces.
Long flue travel.
Grates adapted to burning cheaper grades of fuel.
Handy cleanout doors.
Fine construction generally.

Adds to Your Reputation

The one you save money for every year is going to be a good advertisement for you. Gurney Heaters are doing that consistently.

Users are surprised at their simplicity and ease of operation and cleanliness. You will do a distinct service to the one for whom you install this modern heating system. Cuts work in half. Concentrates every ounce of energy in coal. A business builder for you in every respect.

This is a Photograph of a No. 935 Steam Sectional (cut-out-view)

GURNEY HEATER M'F'G COMPANY
GENERAL OFFICES, BOSTON, MASS.
93-97 OLIVER STREET, FORT HILL SQUARE

GURNEY HEATER CO., INC.
NEW YORK
MANLY ST. COR. ANABLE AVE
LONG ISLAND CITY

GURNEY HEATER M'F'G CO.
RICHMOND, VA.
418 EAST MAIN STREET

GURNEY HEATER CO., INC.
PHILADELPHIA
108 NORTH 17TH ST.

Can You Sell Building Owners?

If you can sell Building Owners, Architects and Contractors and are a well-rated concern, or a financially responsible individual a *real opportunity* is open to you as a district representative for Wolff Draft Conditioners.

Wolff Draft Conditioners

have made good—*plus*. In the City of Chicago more than 5300 heating plants, in the finest buildings of all types are equipped with these fuel-saving devices.

They have not only saved fuel, but have improved heating conditions.

Now we are opening new territory, and are looking for good sales representatives.

We can show you letters from leading building owners, architects, heating contractors and engineers, endorsing everything we say about Wolff Draft Conditioners.

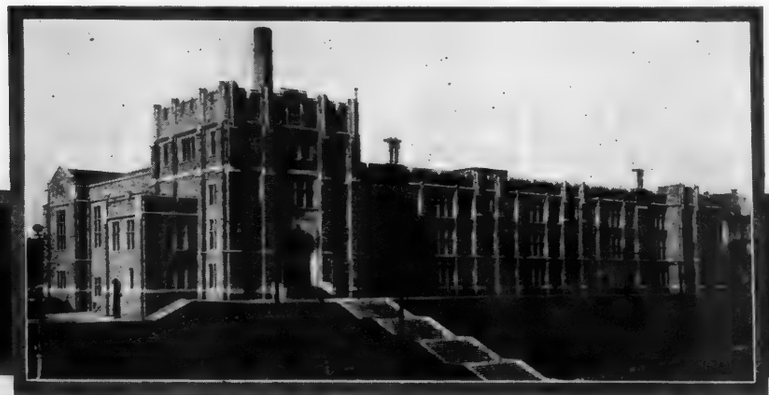
Better than that we can show you any number of installations that prove all of our statements.

You may be just the man (or concern) that we need. If so, there is a fine opportunity for profit, with a heating specialty that won't conflict with anything you now handle.

Write us for facts, and information.

Wolff Coal Saver Co.

1336 West Congress St. Chicago



Langley High School—R. T. Withers & Sons Company, heating contractors—McClure and Spahr, architects.

Westinghouse High School—Bartley O'Niel Company, heating contractors,—Ingham and Boyd, architects.

South Side High School—R. T. Withers & Sons Company, heating contractors—Edward Stotz, architect.

Three of Pittsburgh's New High School Buildings use

TICO SMOKELESS BOILERS

IN these modern Pittsburgh High School Buildings, as in hundreds of similar structures throughout the country—you will find Titusville Smokeless Boilers operating smoothly and efficiently at all times.

Tico Boilers are arranged for burning either anthracite or bituminous coal and are constructed entirely of steel in exact accordance with the latest A.S.M.E. Heating Boiler Code.

Write for Catalogue No. 85—it describes the Tico Smokeless and other firebox boilers in detail.

THE TITUSVILLE IRON WORKS CO.

TITUSVILLE, PENNA.

Sales Offices:
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INTERNATIONAL HEATERS

Steam 98 Per Cent Dry —Without a Header!

Baffle plates in each section of the ECONOMY SMOKELESS BOILER and the high steam dome insure 98 per cent *dry* steam. The water line is always above the open flue surfaces, protecting the boiler from damage and conserving the heat.

No header is required. This feature reduces the cost of the installation and saves head room.

There are plenty of other reasons why THE ECONOMY SMOKELESS BOILER is both economical and efficient.

Ivey Department Store, Charlotte, N. C. Heated by two No. 110 - S - 47 Economy Smokeless Boilers: Wm. H. Peeps, Charlotte, architect; A. Z. Price, Charlotte, heating contractor.

The ratings are *guaranteed.* If you have 4150 square feet of direct radiation load, put in an International Economy Boiler rated at 4150 square feet.

The air control insures proper combustion — conserving fuel and consuming smoke.

All flue surfaces are easily cleaned from the front. There are no unreachable soot pockets to reduce heating efficiency.

The ECONOMY SMOKELESS BOILER develops full capacity for longer than usual periods.

Dealers — Heating Engineers—send for Catalog 1751-H, giving detailed specifications.

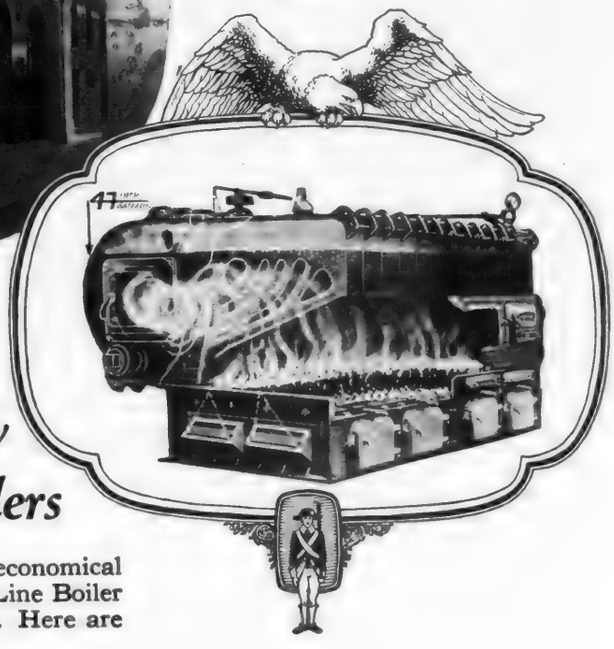
INTERNATIONAL HEATER CO.
UTICA, N. Y.

Cleveland Chicago
Detroit Nashua, N. H.
New York City

ECONOMY SMOKELESS BOILERS

Continental
BOILERS & RADIATORS

The State Bank
Coney Island, N. Y.
Heating Contractor
J. C. Newton
One No. 39-S Continental Low Water Line Boiler



Meeting Demand for Economy With Continental Low Water Line Boilers

TO get a job in a bank a boiler must be an economical boiler. A No. 39-S Continental Low Water Line Boiler was chosen for the State Bank at Coney Island. Here are some of its economies:

Low 43-inch and 47-inch water lines make it economical to install in shallow basements.

Ample space between water line and low point of main eliminates water-line troubles.

Side feed and easy firing make them easy on fuel.

They burn any kind of fuel—well adapted for oil burning.

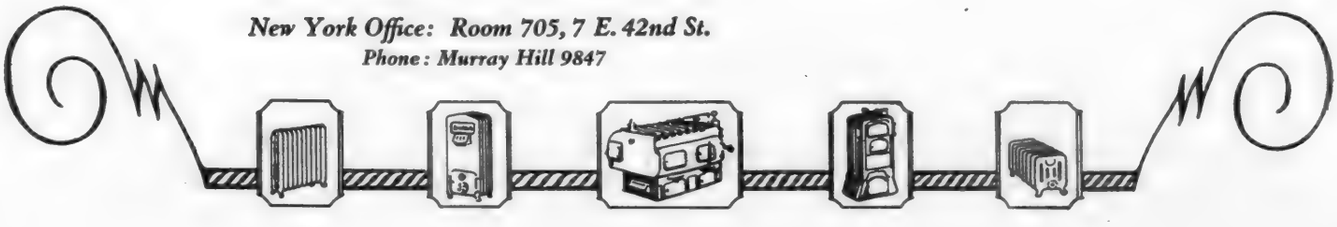
Continental Boilers and Radiators are built for better heating. Heating engineers, contractors, and jobbers everywhere are finding them profitable to handle.

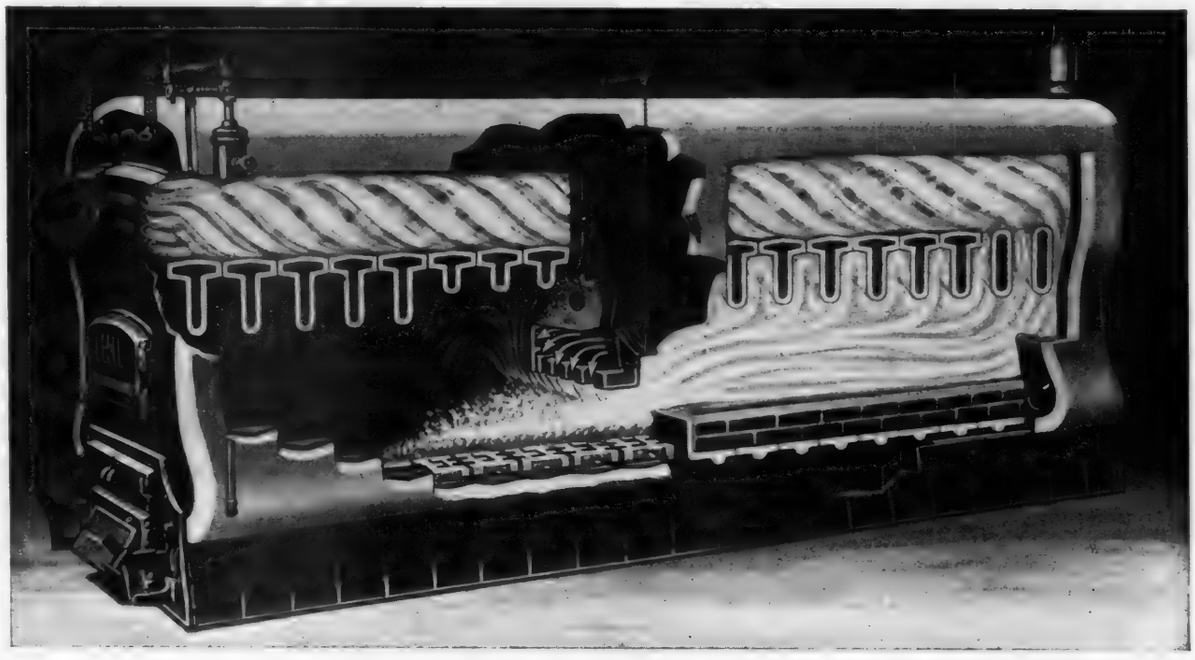
30 Series Boilers—43-inch Water Line, 1200 to 8200 sq. ft. steam capacity.

40 Series Boilers—47-inch Water Line, 2500 to 22,300 sq. ft. steam capacity.

Continental Heater Corporation
Home Office and Factory
Dunkirk, N. Y. U.S.A.

New York Office: Room 705, 7 E. 42nd St.
Phone: Murray Hill 9847



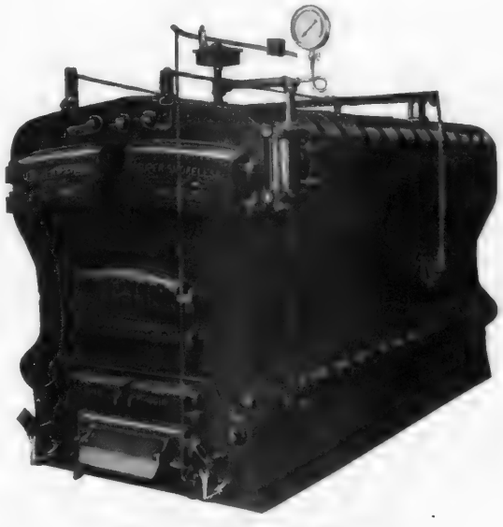


Cutaway View of Utica-Imperial SUPER-SMOKELESS Boiler

UTICA-IMPERIAL
SUPER-SMOKELESS BOILERS

Insurance Against the Fuel Situation

A recent improvement put the Air Regulation under easy control from the front of the boilers.



Exterior View of Boiler

Utica-Imperial SUPER-SMOKELESS Boilers will not only burn soft coal and fuel oil with the utmost efficiency, but will, when required, utilize other types of available fuel, thus protecting the owner against any emergency, and providing an insurance against the fuel situation. In these days of high fuel costs, it is of the utmost importance that heating boilers should be able to utilize the cheapest available fuel. Utica-Imperial SUPER-SMOKELESS Boilers will burn even the cheaper grades of soft coal not only smokelessly but with maximum efficiency, and will utilize other fuels with great economy and efficiency.

Manufactured by the

UTICA HEATER COMPANY

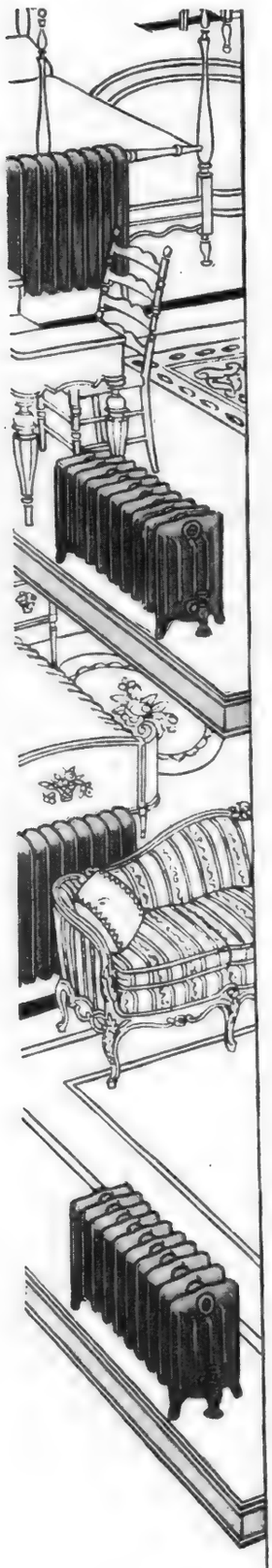
"Pioneers in Smokeless Combustion"

UTICA, NEW YORK

CHICAGO CLEVELAND NEW YORK

Sales Offices in the Principal Cities

DEPENDABLE HEAT ALL OVER THE HOUSE WITH ECONOMY



Guaranteed heating changes guess to facts

The difference between the old order of boiler ratings and guaranteed heating is as wide as the gap between guesswork and certainty.

Little wonder that men who deal in facts, architects, engineers, contractors, and builders, were so ready to approve and accept this sound solution to one of the heating industry's oldest problems.

Striking color pages in national magazines broadcast the advantages of Capitol guaranteed heating month after month. Your clients know that their warm satisfaction is assured when Capitol Boilers are specified and installed.

A request by letter will bring you complete information, without obligation.

UNITED STATES RADIATOR CORPORATION
DETROIT, MICHIGAN

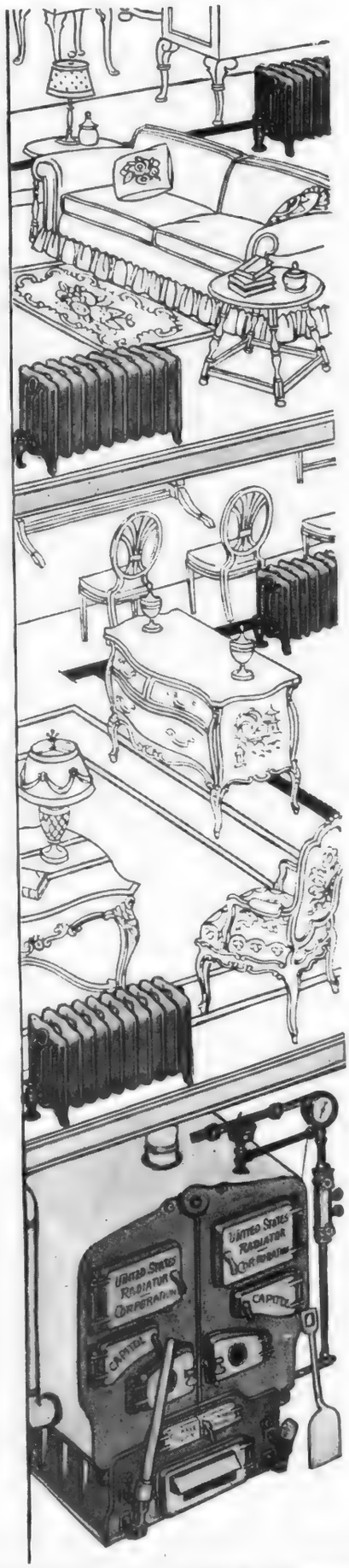
6 FACTORIES AND 28 ASSEMBLING PLANTS
SERVE THE COUNTRY

For 36 years, builders of dependable heating equipment

Capitol Boilers

and

UNITED STATES RADIATORS

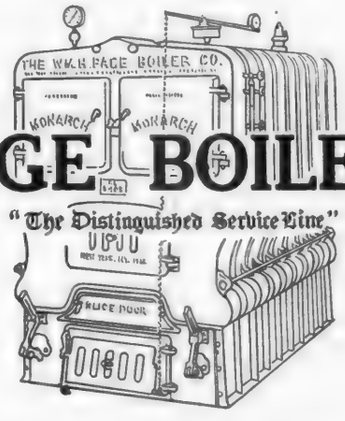


SUPPLIED AND INSTALLED NATIONALLY BY ESTABLISHED HEATING CONTRACTORS

Monarch 60″ Smokeless Boilers—constructed on the sound basic principles that have assured the success of Page Boilers since 1856, when the first square sectional cast iron boiler to be manufactured in the United States was introduced—have again demonstrated, since they were placed on the market, the extent of real heating satisfaction and economy that may be realized.

Burn soft coal, *smokelessly,* utilizing all the combustible. Highly efficient and economical when fuel is hard coal, coke or oil.

60″ grate. 60″ water line. Capacities to 29000 sq. ft., steam. Write for your copy of Catalogue No. 52.



PAGE BOILERS

THE WM. H. PAGE BOILER CO.

200 Madison Avenue

NEW YORK

BOSTON **CLEVELAND**
PHILADELPHIA **MEADVILLE**

Established 1856 **Incorporated 1876**

This boiler has no staybolts

There are no staybolts in Stanwood Boilers!

The mineral imps of water with their rasps and saws of corrosion never worry Stanwood Boiler owners. No crown sheets—no staybolts. No mud-legs—no staybolts.

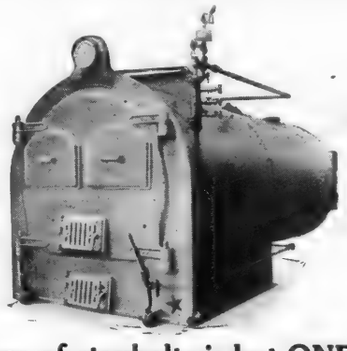
The water that wears away the stones makes quick work of staybolts—ask the man who owns some.

Absence of staybolts is only one of 17 such definite, tangible features of boiler superiority incorporated in the greatest small high and low pressure boiler of all time.

Learn *all* about these boilers from the pamphlets we'll gladly send. Use the coupon—now, on the impulse.

STANWOOD
Smokeless BOILERS

Sizes 29 H. P. to 210 H. P.



Pressures 15 lbs. to 200 lbs.

Absence of staybolts is but ONE of 17 features in this boiler that save MONEY in installation, operation and MAINTENANCE.

1. Installation possible in 3 to 4 days.
2. Small space required for installation.
3. Low water line—45 to 77 inch water line.
4. No outside bricks—minimum standard inside.
5. 70% efficiency where HRT type shows 60%.
6. Down draft furnace for perfect combustion.
7. No air leaks.
8. Slight radiation losses.
9. Quick steaming.
10. Low stack temperature.
11. Smokeless.
12. No staybolts.
13. No crown sheet to bag.
14. No mud-legs.
15. Easy to fire.
16. Easy to clean.
17. Rapid circulation.

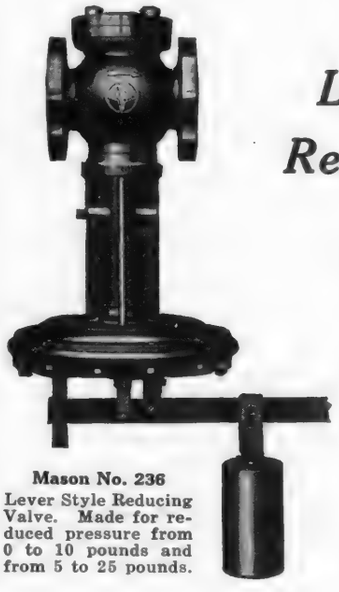
THE STANWOOD CORPORATION
CINCINNATI
Established 1891

USE THIS COUPON D6

Please send bulletins on low high pressure smokeless boilers to:

These bulletins have been prepared by one of America's foremost mechanical engineers and contain valuable information and advice.

SPECIFY
MASON



Mason No. 236
Lever Style Reducing Valve. Made for reduced pressure from 0 to 10 pounds and from 5 to 25 pounds.

Low Pressure Reducing Valves for Heating Systems

Engineers are finding it to their advantage to specify Mason on all heating jobs from the standpoint of low initial cost as well as the low service cost assured by Mason standards of design and workmanship.

Let us send you Catalog 62 containing complete information.

Mason Regulators
MASON REGULATOR CO.
Boston, Mass.

27

Especially designed for larger buildings

IDEAL BOILERS

FOR every building, large or small, there is an Ideal Boiler that will give perfect warmth.

For larger buildings, where economy is as important as efficiency, Ideal Water Tube Boilers and Ideal Smokeless Boilers are becoming more and more popular.

Architects and Engineers all over the country have found that a battery of these boilers is the most economical way to heat big buildings.

With a battery, only one boiler or two or more, according to the size of the building, need be fired during the milder parts of the heating season.

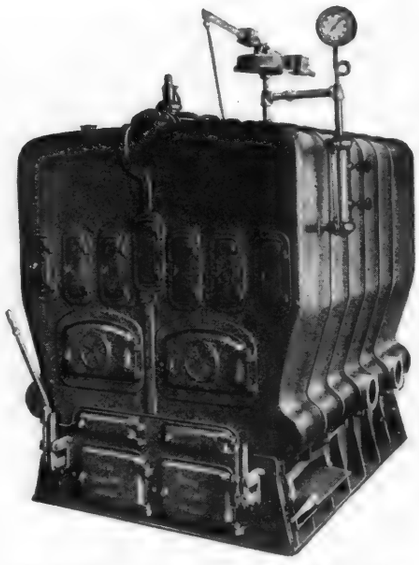
We shall be glad to send you an illustrated descriptive booklet if you will write for it.

There is an Ideal Boiler for every building from the smallest cottage to the largest apartment house, office building, bank, church, school, club, hotel, library, factory or other building.

AMERICAN RADIATOR COMPANY

Showrooms and sales offices: New York, Boston, Providence, New Haven, Newark, Philadelphia, Baltimore, Washington, Richmond, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Atlanta, Chicago, Milwaukee, Indianapolis, St. Louis, St. Paul, Minneapolis, Omaha, Denver, Kansas City, San Francisco, Los Angeles, Seattle, Toronto, London, Paris, Milan, Brussels, Berlin

Makers of IDEAL BOILERS and AMERICAN RADIATORS and other products for heating, ventilating and refrigeration



The Burnham Twin has a capacity of from 7,850 to 16,550 sq. ft. for steam, and 12,600 to 27,000 sq. ft. for water.

A Surprising Instance of Theatre Heating Economy

Two years ago, one of the two steel tubular boilers in the Hurtig and Seaman Theatre of New York gave out. Through a small opening in the sidewalk, it was replaced by a Burnham Twin Sectional. It was planned to follow with another Burnham when the other tubular failed.

The first tubular gave out right in the midst of the Winter's coldest time, putting all the load on the one cast-iron Twin Sectional Burnham. The Twin Sectional did the work so satisfactorily that we lost the sale of the second boiler. Lost its sale, but made a warm friend in every sense of the word.

Would you like fuller facts and the exact heating figures?

Burnham Boiler Corporation

IRVINGTON, N. Y.

New York Office: 30 East 42nd Street

Representatives in all Principal Cities

Canadian Offices: Harbor Comm. Bldg., Toronto 124 Stanley St., Montreal

EACH RADIATOR AN INDEPENDENT STEAM HEATING PLANT

Consolidated Gas Co. Bldg., New York City

Combination Heating—

The New York Consolidated Uses It For Its Own Offices

Steam heat or hot water for any office or any group of offices is always available—even when the central heating plant is closed down—with combination heating systems.

When the central heating plant is operating, the Clow Gasteam Radiators function as any other radiator. When the central heating plant is closed down, the Gasteam Radiators produce their own steam.

Clow Gasteam Radiators hooked into standard steam or hot water systems supply heat quickly and economically, at times when the boiler is not used, such as nights, holidays, and in the fall and spring.

Combination heating permits of starting the boiler a month or two later in the fall and shutting it down a month or two earlier in the spring. The cost of the installation is negligible in comparison with the savings and convenience.

JAMES B. CLOW & SONS

201-299 N. Talman Ave., Chicago

Offices in Principal Cities

CLOW

GASTEAM — GASWATER

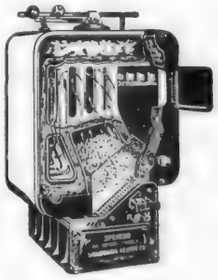
"We want to advise you that we are about to repeat our spring drive of last year * * * * * * * *

"It will interest you to know that last Spring we took orders in this way for twelve Spencer boilers in one lot, with as many more added later. This selection on the part of our customers was due to the magazine feature of the Spencer, which insures uniform and dependable results for twelve-hour stretches, and to the ability to secure almost without restriction thoroughly good fuel at a cost less by one-third than that of the usual cost of domestic size anthracite coal, which this year has been procurable only in ton lots.

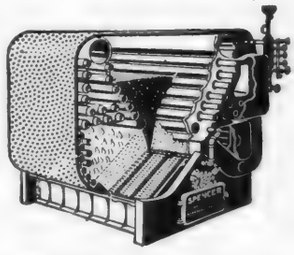
"The annual saving in fuel cost effected by the Spencer boiler makes it the highest paying dividend investment that can possibly be found, and many customers appreciating all of these features give the Spencer the preference."

The New England firm of contracting heating engineers who wrote us this letter, indicate how they developed profitable business at the end of the heating season.

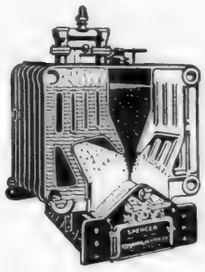
Are you getting your share of this profitable business?



SPENCER
Single Grate Heater



SPENCER Steel Tubular Heater
for large installations



SPENCER
Double Grate Heater

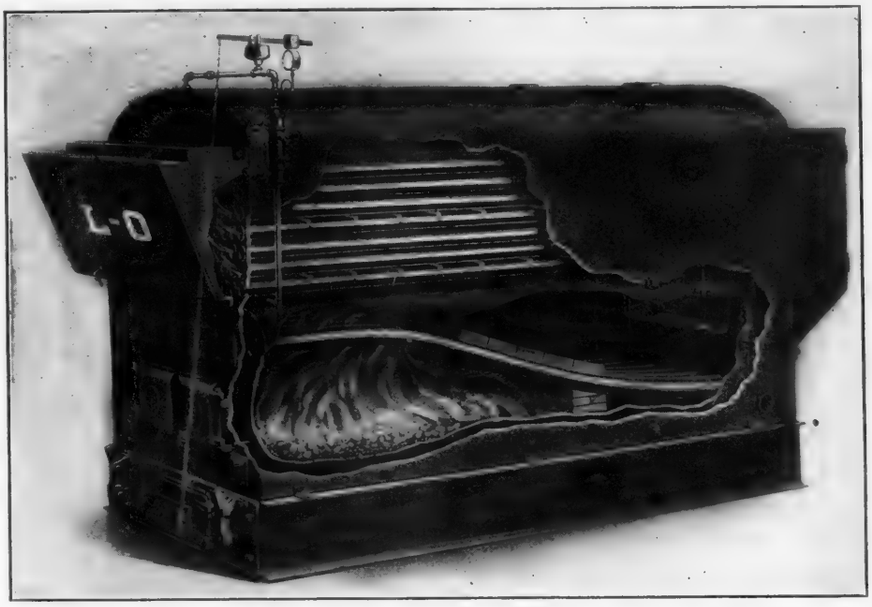
Spencer
steam, vapor or hot water
Heaters
burn No.1 Buckwheat coal

A size and type for every purpose *Sold only through heating contractors*

SPENCER HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.

New York City Boston Philadelphia Baltimore Buffalo Rochester Hartford Washington Detroit Schenectady Syracuse Harrisburg Scranton

LEBANON L-O BOILERS



Shipped Assembled Complete

The boiler is bolted securely to its own steel base, with the grates, bridgewall, and refractory combustion arch fastened in place, ready for operation.

The complete unit may be skidded on its own base.

Installation cost is very much reduced

LEBANON BOILER WORKS

J. K. PETTY & CO., Inc., Proprietors

PHILADELPHIA OFFICE
507 Harrison Bldg.
(15th & Market Sts.)

Main Office and Works
1244 Buttonwood Street
LEBANON, PA.

Koithan & Pryor, Representatives
39 Cortlandt St., NEW YORK CITY

Representatives in Principal Cities

Dealers Wanted

An opportunity for the Heating Engineer

The "Electric Furnace Man"

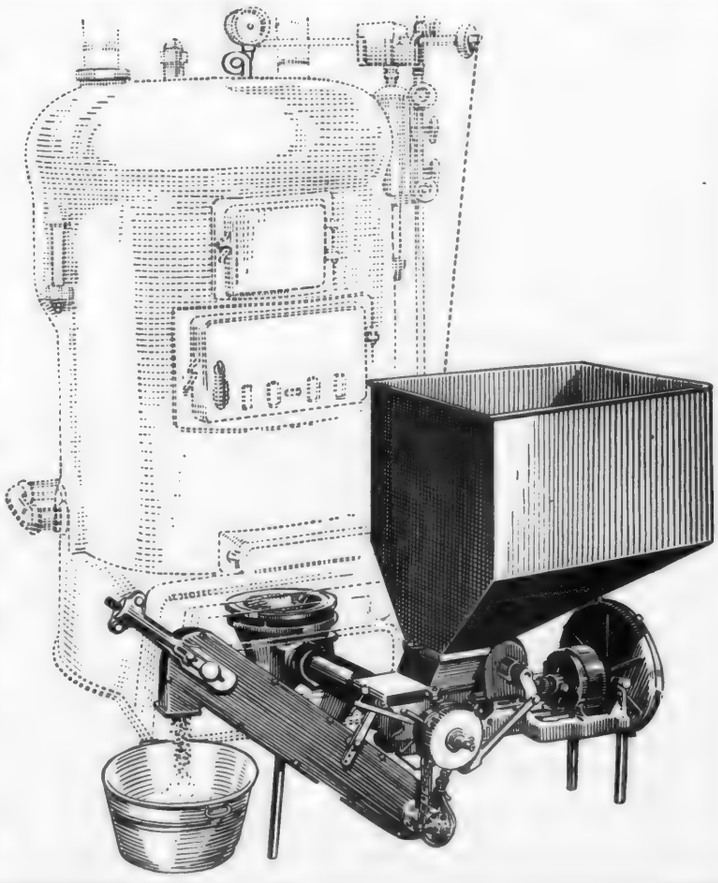
an automatic stoker—burns cheap coal—Buckwheat or Rice—puts coal on the fire—keeps fire burning—takes away ashes.

Operates electrically and is a time, money and labor saving device.

Can be installed easily and quickly in Hot Air Furnaces, Steam or Hot Water Boilers.

Some exclusive territory still available in the Eastern Anthracite Coal Burning District.

This is a real profitable business opportunity. Investigate now our agency proposition.



Domestic Stoker Co.

Seven Dey Street New York

Great
News
Coming!

Great News Here ~ ~ and Still More Coming!

formerly—

HOME APPLIANCE CORPORATION

Now!

ELECTROL INCORPORATED
OF MISSOURI

Electrol Incorporated of Missouri is the new name of the corporation manufacturing the ELECTROL Quiet, All-electric Oil Burner—formerly The Home Appliance Corporation.

The name has been changed to conform with the name of the product. A sound, progressive organization is back of every ELECTROL distributor and every burner that goes into service. Factory facilities have been increased and even more highly developed. Great things are ahead! Great News Coming!

Present and prospective ELECTROL distributors should watch for the important announcement to be made in the next issue of this publication.

Great News Coming . . . !

ELECTROL INCORPORATED
OF MISSOURI

SAINT LOUIS, U. S. A.

(Scott-Newcomb System)

ELECTROL

Quiet, All-Electric Oil Burner

Ross Boilers

may look like others, BUT:—

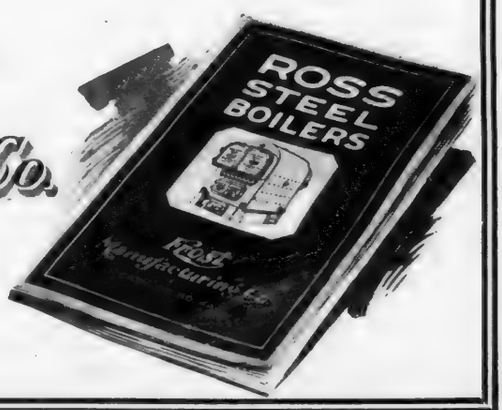
within the outer walls there are many patented features which allow the quick almost complete absorption of heat units from low grade fuel, either coal or oil.

Architects and engineers are specifying these boilers on many very prominent installations where steady heat, economy of fuel and little operating attention is a necessary requirement.

One of thirty sizes ranging in capacity from 400 to 27000 square feet.

Also manufacturers of highest types of high pressure boilers.

This catalog sent on request.



The Frost Manufacturing Co.

—Since 1851—

Main office and works 1520 HENDERSON ST., GALESBURG, ILL.

HERE'S THE TROUBLE and HERE'S THE CURE

Ordinary butt-weld pipe, showing characteristic patches of welding-scale on the inside surface.

Patches of Scale on the interior surface of pipe mean:

Increased corrosion—especially pitting.

Greater friction loss.
Less delivery capacity.

Poor base for galvanized coating.

Valve seats damaged and small orifices clogged.

Pipe that is free from Scale means:

Minimized corrosive tendencies —particularly pitting.
Less friction loss.

Full delivery capacity.

Good base for galvanized coating.

No scale to damage valves or clog small openings.

"NATIONAL" SCALE FREE Pipe, showing the clean, smooth surfaces of this modern product.

"NATIONAL" Pipe, butt-weld sizes ½ to 3-inch, is made by the SCALE FREE Process, which removes the scale and leaves a clean, smooth surface. This process was invented and developed by National Tube Company—therefore, only "NATIONAL" Pipe is made Scale Free. For details of this process and its advantages, write for a copy of "NATIONAL" Bulletin No. 7.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

GENERAL SALES OFFICES: FRICK BUILDING

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Atlanta Boston Chicago Denver Detroit New Orleans New York Salt Lake City Philadelphia Pittsburgh St. Louis St. Paul

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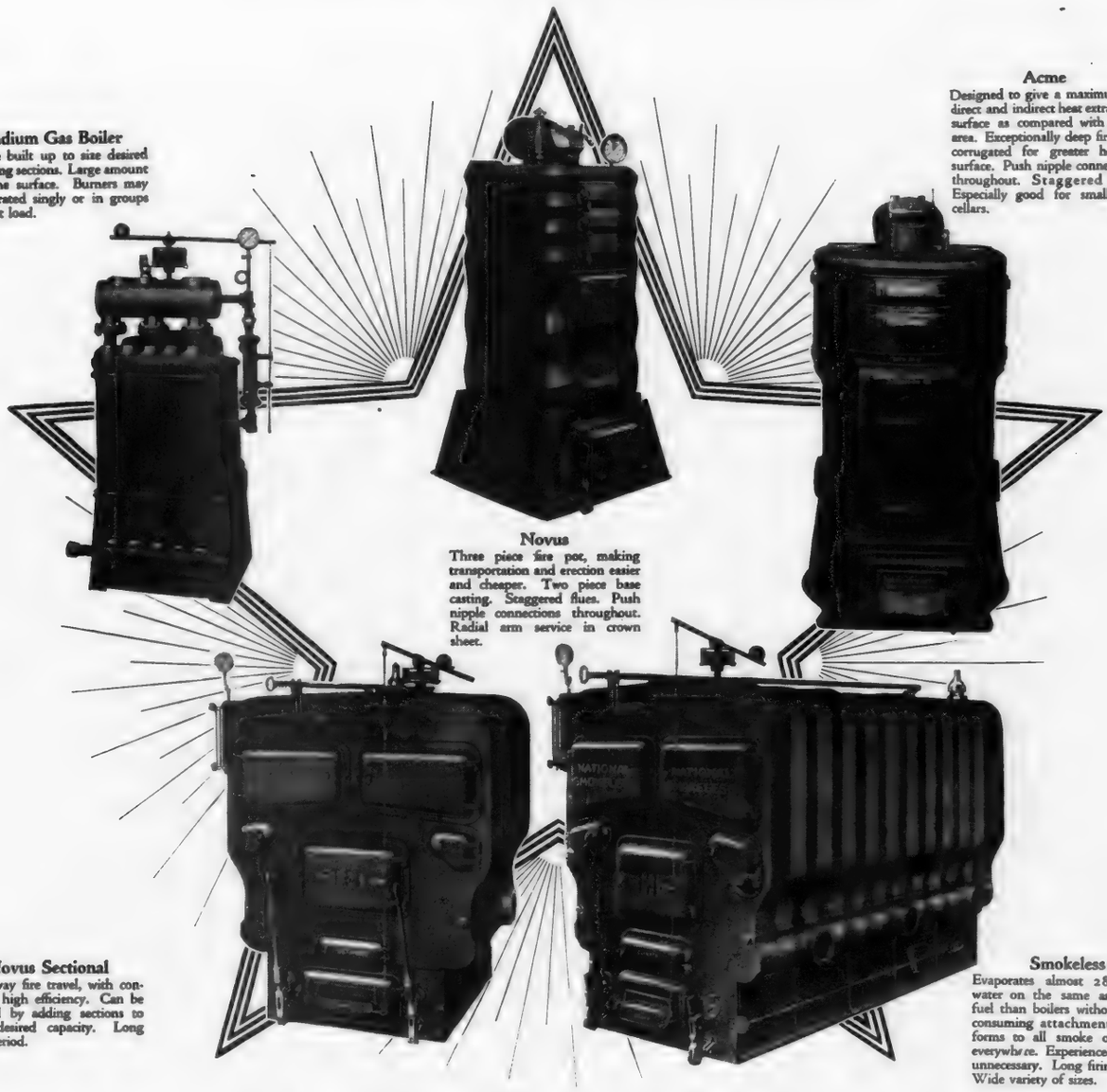


Radium Gas Boiler
Can be built up to size desired by adding sections. Large amount of prime surface. Burners may be operated singly or in groups on light load.

Acme
Designed to give a maximum of direct and indirect heat extracting surface as compared with grate area. Exceptionally deep fire pot, corrugated for greater heating surface. Push nipple connections throughout. Staggered flues. Especially good for small, low cellars.

Novus
Three piece fire pot, making transportation and erection easier and cheaper. Two piece base casting. Staggered flues. Push nipple connections throughout. Radial arm service in crown sheet.

Novus Sectional
Three way fire travel, with consequent high efficiency. Can be enlarged by adding sections to attain desired capacity. Long firing period.

Smokeless
Evaporates almost 28% more water on the same amount of fuel than boilers without smoke consuming attachments. Conforms to all smoke ordinances *everywhere*. Experienced firemen unnecessary. Long firing period. Wide variety of sizes.

An all-star lineup for today's heating game

Today's contractor and fitter handles a wide range of jobs, that call for a wide range of heating equipment. Small homes—mansions—apartments—schools—churches—stores—each calls for a different style and type of boiler.

In the National line is found this necessary diversity of style—a wide range of conservative ratings, with which is combined unvaryingly high standards of quality and performance, using gas, coal or oil as a fuel.

Since you can only hope to get the most from your installations by combining your ***best work*** with the ***best boilers***—

Why not write today for National literature and discount sheets?

NATIONAL RADIATOR COMPANY
JOHNSTOWN, PA.
PLANTS: Johnstown, Pa. New Castle, Pa. Trenton, N. J.
BRANCH OFFICES: New York, Philadelphia, Baltimore, Washington, Richmond, Pittsburgh, Cincinnati, Cleveland and Chicago.

NATIONAL BOILERS

Can you discuss, intelligently, the latest—perhaps greatest—comfort-development in OIL HEAT ?

THE new Silent Nokol has changed many conceptions of the past, in regard to home heating comfort with automatic oil heat. Noise has been cut to the vanishing point.

The famous Nokol combustion chamber has greater effectiveness, even longer life, than ever before. Past high efficiency has been maintained—even increased.

Full data sent on request.

Address: The American Nokol Company, 215 N. Michigan Ave., Chicago, Illinois.

THE NEW *Silent* NO COAL NOKOL

AUTOMATIC OIL HEATING FOR HOMES

First domestic oil burner listed by Underwriters' Laboratories; approved by all leading safety boards. Manufactured and guaranteed by AMERICAN NOKOL COMPANY, Chicago.

When you use an Oil Burner

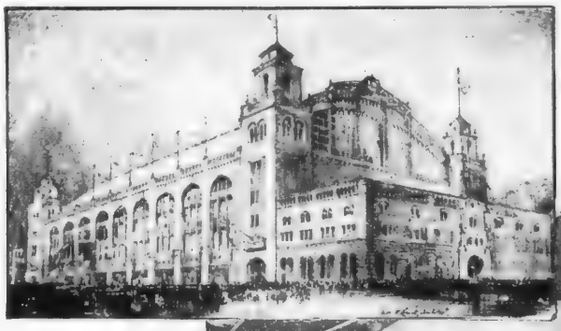
Taco Semi-Indirect attached to steam heating boiler makes it possible to heat domestic water from the same boiler, and with the same oil burning equipment as is used for heating the building. This makes unnecessary the installation of a separate hot water supply equipment, the use of coal, or the installation of a separate oil burning equipment.

Closing the valves in the main and the return makes practical the use of the house heating boiler in the Summer for heating water.

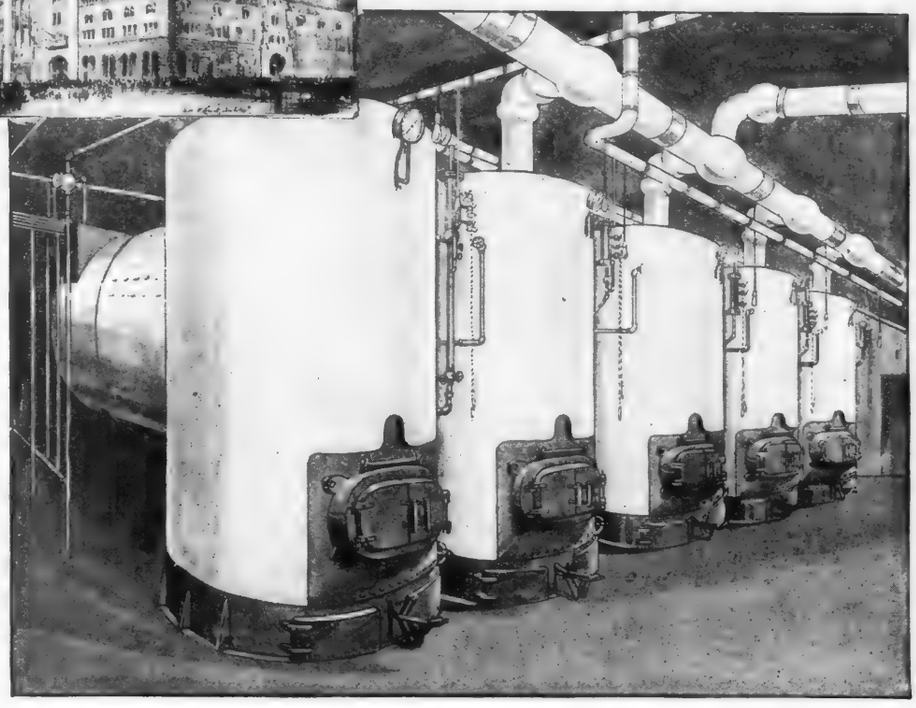
Taco Semi-Indirect, with its three connections to the heating boiler, starts heating the water as soon as the oil burner comes on, and before any steam is generated. This is made possible by the two connections below the water line permitting the boiler water to circulate over the copper tubes containing the domestic water. The upper portion exposed to steam heats quickly during such periods as the oil burner is in operation.

The importance of oil burning equipment is now recognized and to meet the growing popularity of the oil burner, our Engineering Department has carried on investigations and tests, resulting in the Semi-Indirect Taco—for use with oil burners, for heating domestic water.

Thermal Appliance Company
342 Madison Ave., New York



New Madison Square Garden,
49th to 50th Sts. and 8th Ave.,
New York City



High pressure plant of five—225 H.P. Fitzgibbons Boilers—125 lbs. W.S.P.—in the New Madison Square Garden.

THOMAS W. LAMB,
Architect.

Woolfolk-Kimball Co.
Heating and Power Contractors.

Fitzgibbons Boilers Carry the House in "The Showroom of New York"

The architect and consulting engineer have booked Fitzgibbons High Pressure Boilers for years of uninterrupted and efficient power and heating performance for the comfort of the millions of patrons of the colossal New Madison Square Garden. The booking agents naturally investigated past performances before letting this exclusive contract. A thorough review of thousands of Fitzgibbons appearances for 40 years before audiences of most critical architects, engineers and owners clinched this outstanding engagement.

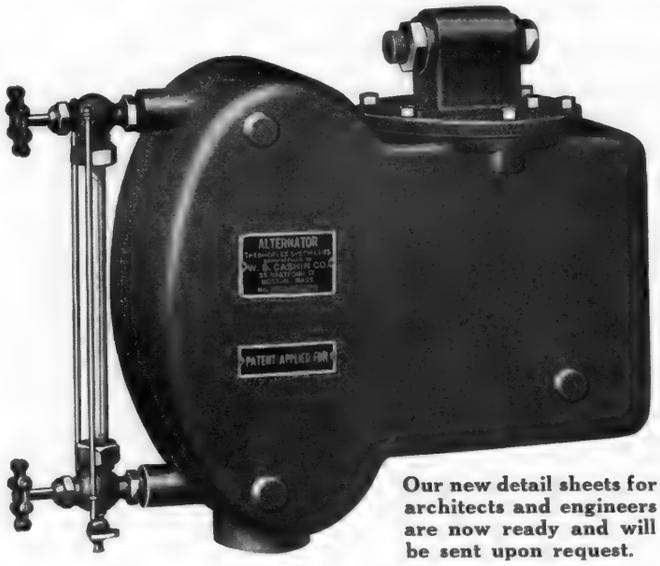
The same performance is being repeated daily in thousands of buildings—from the huge Madison Square Garden with its high pressure power-plant down to the six-room home with its 400 sq. ft. Fitzgibbons STEEL heating boiler. Send for a complete program of all sizes.

FITZGIBBONS BOILER COMPANY, INC.

Sales and Executive Offices

570 SEVENTH AVENUE NEW YORK CITY

Thermoflex Alternator Trap



Our new detail sheets for architects and engineers are now ready and will be sent upon request.

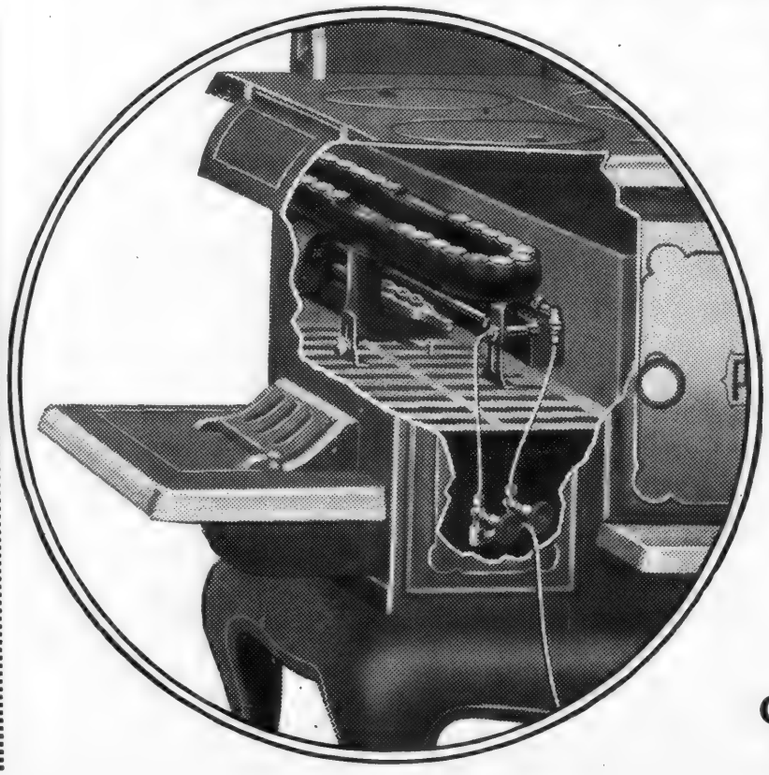
A vital part of the Thermoflex Vapor Heating System. Insures return of condensation to boiler under varying pressure conditions. Simple in design and sturdily constructed.

A few of the rapidly growing list of Thermoflex installations:

MYLES STANDISH APARTMENTS, Boston, Mass.
PELHAM HALL, Boston, Mass.
BURROUGHS PUBLIC LIBRARY, Bridgeport, Conn.
UNION TRUST CO., Providence, R. I.
GABLES APARTMENTS, Cincinnati, Ohio.
HIGH ST. PROPERTIES, Buffalo, N. Y.
ST. JOHN'S PREPARATORY SCHOOL, Danvers, Mass.
BOSTON & MAINE OFFICE BLDG., Boston, Mass.
SACRED HEART CHURCH & SCHOOL, Lawrence, Mass.
BRIDGEWATER NORMAL SCHOOL, Bridgewater, Mass.
BALTIMORE FIRE DEPT. SHOPS, Baltimore, Md.

W. D. CASHIN COMPANY
35 Hartford St., Boston, Mass.
Representatives in Principal Cities

Why Not a Complete Line?
An Oil Burner for Every Purpose



For instance, the **Oxo-Gas Oil Burner** installed in a cook stove (illustrated) makes and burns a blue flame gas of high heating efficiency. It will operate from seven to nine hours on one gallon of kerosene or distillate.

Also, the wonderful **"Safety First" Heater** for use in garages, offices, homes, etc., and other burners for every conceivable purpose.

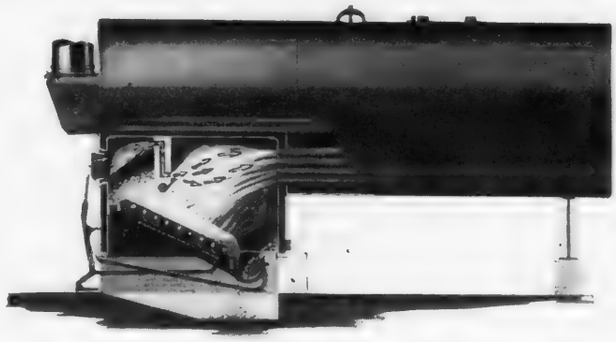
Send for catalog and our dealers' proposition.

GLORIA LIGHT COMPANY
108-116 N. May St., Chicago, Ill.

"...a real forward step in the burning of coal...

absolutely eliminates smoke . . hand cleaning done away with . . ''

WHEREVER installed, the **CombustiKator** is outstanding for its simplicity, capacity and economy. The preheating and complete ignition of the volatile; coking of all green coal; absolute elimination of all hand cleaning are features that make the **CombustiKator** the perfect fireman—the ideal method of burning coal.



CombustiKator installed in Kewanee Boiler, showing inside hopper, method of coking coal and pre-heating volatile, etc.

"We put in six CombustiKators . . . only after a careful test of the operating features and efficiencies in one of our largest schools. . . A saving of 480 tons of coal was made the first year. We are doing even better now.

"What appealed to me so strongly is that the CombustiKator is more than a piece of apparatus. It is really a method of burning coal. Fundamentally correct, . . . it has absolutely eliminated smoke. Combustion efficiency is high. Hand cleaning of fires is done away with.

"Still further, the CombustiKator is absolutely 'fool proof'. A janitor can handle it as easily as a fireman. In my opinion the CombustiKator is a real forward step in the burning of fuel. I believe it has solved the smoke problem."

The above are excerpts from a letter written by the chief engineer for the Board of Education of a large western city where the CombustiKator is making huge economies by burning low-grade coal smokelessly.

Only 3 Simple Operations

Each easy and fool-proof

1. **Throw coal against wall.**
2. **Pull of lever advances fuel over inclined bed, leveling, renewing, cleaning fuel bed and keeping it free from ash.**
3. **Release of lever discharges ash into ash pit.**

No skill required. No knowledge necessary. Mistakes are impossible.

There is a size of CombustiKator *for every type of Kewanee firebox boiler, return tubular and horizontally baffled water-tube boiler from 20 to 1000 hp. and for every type of coal.*

Ask for full details about the CombustiKator.

The CombustiKator Company

Division of CoKal Stoker Corporation

1014 Wrigley Building, Chicago

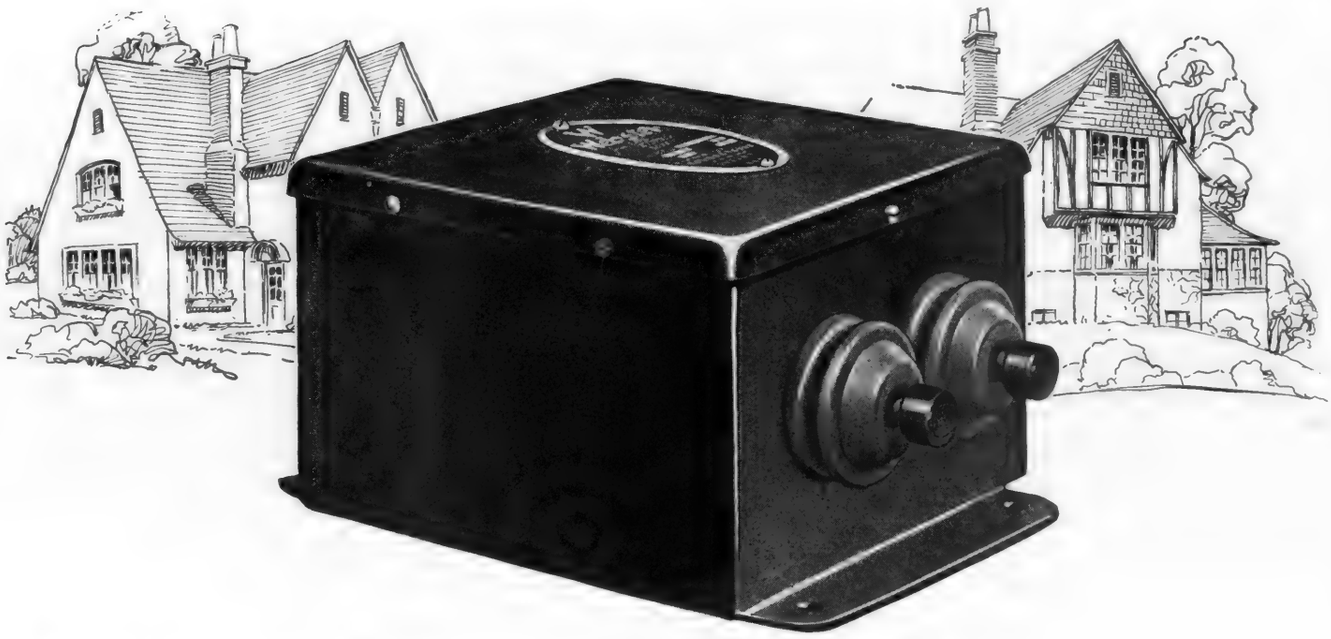
Kansas City *New York City* *Philadelphia* *Pittsburgh* *St. Louis*

INSIDE HOPPER
GRAVITY FEED

COKAL COMBUSTIKATOR

Reg. U. S. Patent Off.

CORRECT COAL BURNING ASSURED



A Transformer Specially Designed for Oil Burners

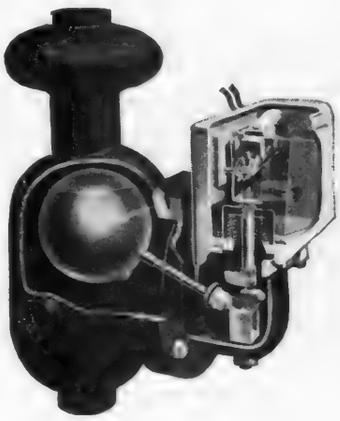
IN the new Webster Ignition Transformer, oil burner manufacturers will find an exceptionally efficient and dependable ignition unit. ¶ This transformer, specifically developed and especially designed for oil burner ignition by the Webster engineering laboratory, possesses many unique and advantageous features which oil burner manufacturers will be quick to appreciate. ¶ It produces a spark of unusual size and length at normal voltage, with an exceptionally low power input. ¶ It delivers an unusual spark over a wide range of voltage — even with an abnormal line drop. ¶ It is as well constructed as it is efficient, being fitted with porcelain terminals for the high tension leads and having an inbuilt, self-contained junction box with knock-outs to permit bringing in primary leads in three positions. ¶ Under operation, heating of transformer is well within standard limits. ¶ In every detail of construction and insulation, the Webster Ignition Transformer is so built as to insure dependable continuous operation.

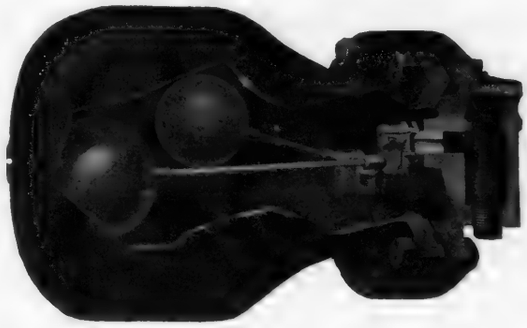
Details regarding it will be supplied upon inquiry.

WEBSTER ELECTRIC COMPANY, RACINE, WISCONSIN

"Specialists in Oil Burner Ignition"

Webster Ignition Transformer





Boiler Protection

By Control of the Oil Burner Motor Current

The McDonnell & Miller Duplex Switch *is not a water feeder*, but a combination low water cut-off and pressure control.

It is designed exclusively for oil-fired boilers and prevents cracked sections or burned boilers when the water line becomes sub-normal by *cutting out the oil-burner motor*. It also automatically cuts out the motor when the pressure rises above a certain predetermined point.

It is installed on the boiler in the gauge glass tappings, the gauge glass being reinstalled in the body of the Duplex Switch.

The Duplex Switch may be applied to all boilers fired by automatic types of oil burners.

By Control of the Boiler Water Line

The McDonnell & Miller Duplex Feeder does *not* have any electrical control features, but protects the boiler against damage by maintaining a normal water line at all times.

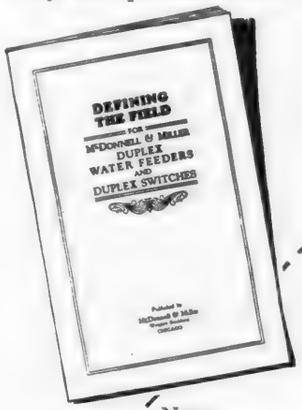
It furnishes make-up water as needed and through its overflow feature, prevents flooding by disposing of any excess condensate that may be returned from the heating system.

Boiler conditions are maintained in the Duplex Water Feeder by steam and water equalizing connections to the steam space and water space of the boiler.

The Duplex Water Feeder may be applied to *any* low pressure steam boiler.

Each unit has a definite field of application which is determined not alone by the physical characteristics of the heating plant, but also by the facilities that are available for installation.

We have just published a pamphlet "Defining the Field" that explains clearly the field of these two boiler protection units. We'd be glad to send you one at your request. Just sign the coupon or pin it to your letterhead.



McDonnell & Miller

"Doing One Thing Well"

General Offices
Wrigley Bldg.
CHICAGO

M&M BOILER CONTROLS

Warehouse Stock
Bush Terminal
NEW YORK

Please Send "Defining the Field"

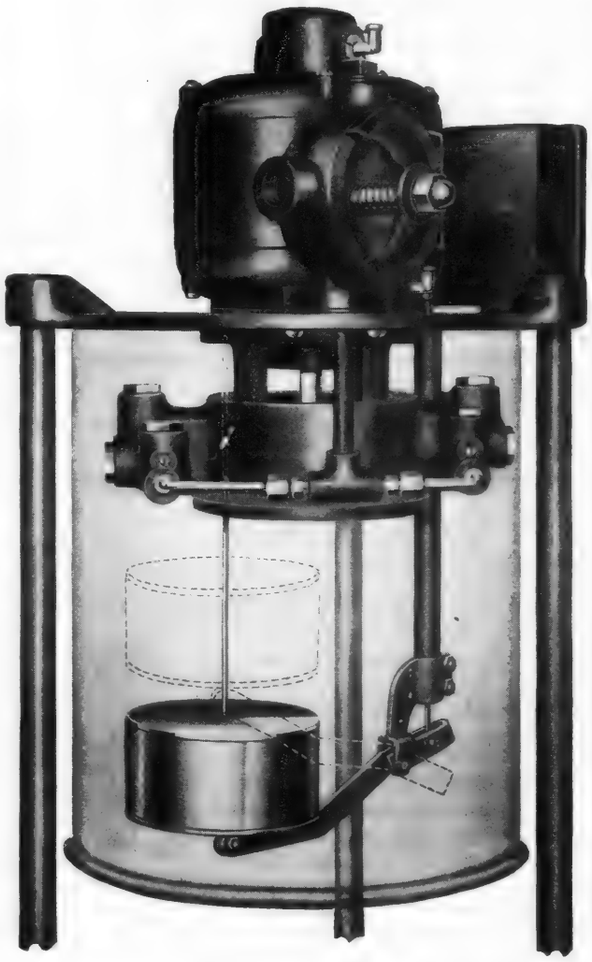
Name.....

Street.....

City.....

Firm.....

The Oil Pump backed by Sixteen Years of Pump Manufacturing Experience



Monroe Oil Pump, Type TJ $85 LIST

Write for Details

This equipment is made by a firm which has been making pumps for sixteen years —it is made strong, durable, automatic, fool-proof. You have a five-year guarantee you will never need. When you look over the pump, see its positive, automatic action and its durable construction, you will appreciate that here, at last, is the oil pump at a popular price you have been waiting for.

Install this oil pump and your troubles are over! There will be no calls in a blizzard for urgent servicing twenty miles away. You can depend on a noiseless, perfect working, dependable job that will give your customer satisfaction—not for one season, but for year after year—you can depend on the Monroe Pump to win many oil burner orders and build up your business.

No More Trouble, Grief or Service Expense

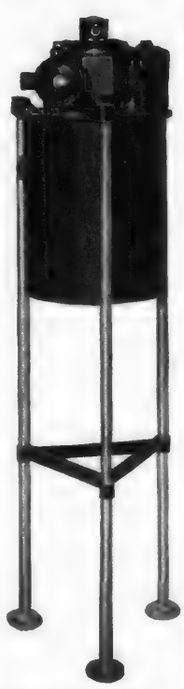
Here is something that will bring welcome relief to all oil burner dealers—that will free them of future trouble whenever they install an equipment. The Monroe is a marvel of efficiency and simplicity; it is entirely automatic; there is nothing to break or wear out, get noisy or go wrong. Coupled with its superior service is the popular price.

MONROE Oil Pump

No oil burner dealer or manufacturer can afford to delay investigation of this remarkable Monroe, Type TJ, listing at $85. It is built along the same lines as its big brother, Type TL, listing at $150. There are many things in this equipment to surprise and delight the service-worn dealer. When you see the TJ, order one and sell dozens of them this coming season. It is the job you have been waiting for to positively meet your customers' requirements with knowledge in advance that it won't fall down—to give your customers the service they want, and save you costly service you don't want.

Specify "Monroe Pumps" on every contract

Large stocks in Chicago and New York



Floor mounted. You can cut iron legs from standard pipe to any required length. Pipe brace comes with pump.

MONROE MACHINE TOOL COMPANY

NEW YORK SINGER BUILDING 149 BROADWAY — 737 W. Jackson Blvd. — CHICAGO — PHILADELPHIA 437 REAL ESTATE TRUST BUILDING

16 YEARS EXPERIENCE MANUFACTURING PUMPS

RAYFIELD

PATENTS PENDING

Automatic Fuel Oil Burners

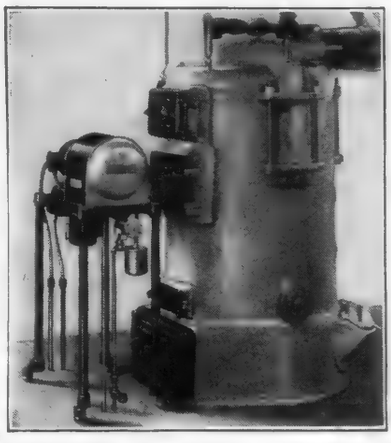
Note These Important Features

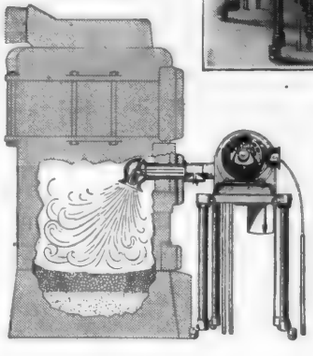
1. Utilizes the Radiant Heat Principle.
2. Positive Electric Ignition.
3. Air-cooled, Non-carbonizing Nozzle.
4. Triple Atomization.
5. Double-Length Flame Travel.
6. No Baffling Walls.
7. Really Quiet (not maybe).
8. Rayfield Flame Safety.
9. Latest Minneapolis Controls.
10. Complete Line—5 sizes.
11. Burns Fuel Oil—28/30 For Homes: Lower Gravities for Factories.

Rayfield's Scientific Combustion

Note the illustration. The nozzle is suspended over the fire pot. The vapor, burning in suspension, is forced directly downward to the crushed fire brick at the bottom, then deflected to the sides and rises evenly along the walls of the fire box before the generated heat escapes through the flue. In this manner the flame travels twice the usual distance in the fire box, giving off the maximum heat at the bottom of the fire box and completing combustion before reaching the flue.

The Radiant Heat principle is utilized through the bed of crushed fire brick placed in the ash pit. In operation this brick quickly becomes incandescent, absorbing and holding the heat that would otherwise be lost up the chimney. Long after the burner has been shut off by the thermostat, this white-hot bed of crushed brick continues to radiate its stored heat and thus assists in maintaining an even temperature throughout the building.





The Rayfield is a Super-system of heating designed and perfected by Chas. L. Rayfield, inventor of the well-known Rayfield Carburetor for automobiles, and an acknowledged authority on the combustion of liquid fuels.

Built by Engineers—Approved by Men Who Know the Heating Business

Heating plant engineers, manufacturers and oil-burner men quickly approve the Rayfield after inspection and testing.

These men came to see what we have. Some of them were open-minded, some were not. They witnessed demonstrations, inspected burners in operation, talked to users and made tests under their own conditions.

As a result of their observations they report that the Rayfield is:

—a simple and quiet power burner

—correct from an engineering standpoint

—equipped with remarkable safety controls.

You are invited to make a similar investigation of the Rayfield, and you should do it if you are following the trend of the heating trade toward oil burning.

For Steam, Vapor, Hot Water, Hot Air

The Rayfield is fully automatic and operates successfully in any good heating plant. It comes in various sizes and has had three years of practical tests in homes, apartments, theatres and factories.

You have been waiting a long time for this scientific oil burner —a burner that you would readily install in your own home after seeing a demonstration.

Send for illustrated circular.

Rayfield Mfg. Co.

21st and Rockwell Sts. CHICAGO

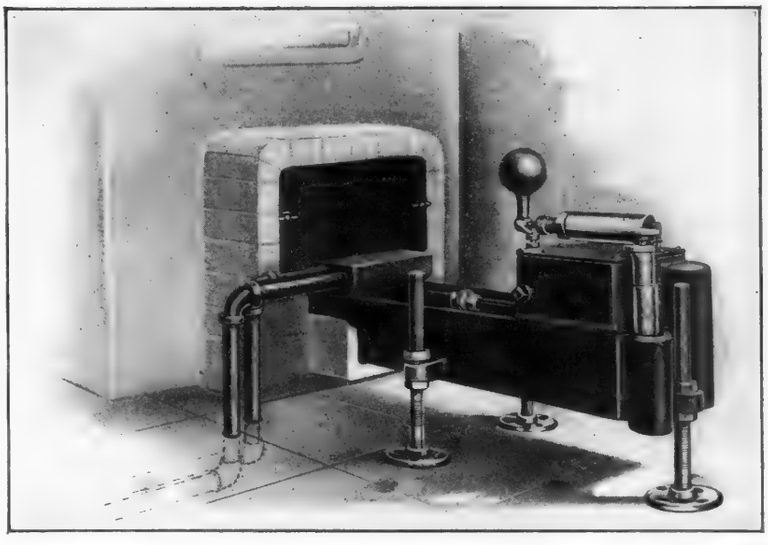
Listed as Standard by the Underwriters' Laboratories

Contractor-Dealers Wanted

The Rayfield franchise will appeal to men who know the heating business. A profitable connection is offered responsible parties who are prepared to demonstrate, sell and install our equipment. Write for territory and further particulars.

Caloroil

takes another jump ahead!



New improvement answers a question that every customer asks about oil burners

A CAST iron enclosure over the atomizing nozzle has been added to the Caloroil Burner.

As shown in the photograph above, the enclosure is entirely bricked in.

This method of installation does four things: (1) Practically eliminates noise of operation; (2) Makes a more rigid job; (3) Practically eliminates service calls; (4) Gives easy accessibility.
"Is it **quiet**?" Every prospect will ask you this question about the burner you are selling. If you are handling Caloroil, you have a convincing answer.

Write us today

We would like to tell you about the Caloroil Franchise for your city, to tell you the whole story about this wonderful burner, to explain how we cooperate with dealers and advertise for them. Write today. Caloroil Burner Corporation, Dept. C2, 5 East 40th Street, New York City.

Caloroil 68°-72°

The **"BALANCED TEMPERATURE"** *Oil Burner*

HOME IS WHERE THE HART IS

The Oil Burner of the Future

Every heating engineer owes it to himself and his patrons to deal frankly with the question of fuel for oil burning equipment.

He knows the greater heating value of low gravity oils. He also knows the tendency of the "cracking" process to take more and more of the intermediate fractions for gasoline. The safe, sure and economical supply of fuel oils for heating lies at the lower end of the scale.

Because of its unusual ability to burn oil as low as 28 degrees Baume test, the Hart Oil Burner holds a high place with engineers. On that basis it is listed as standard by Underwriters' Laboratories, Inc. And of course it burns the higher gravity distillates equally well.

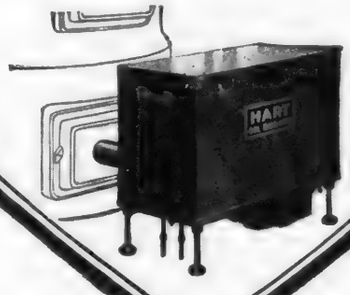
In selecting an oil burner, be sure to select a type for which fuel will be plentiful in the years to come. In addition to this assurance, when you choose the Hart, you get also cleanliness, certainty of performance and silent, odorless operation.

For the information of engineers and architects, we have made up a folder giving brief specifications and other important facts about the Hart Oil Burner. A ready reference guide for busy men. Your copy will be gladly forwarded without cost upon request.

We offer also a fine booklet on the Hart Electric Icer, a new and highly developed electrical refrigerator for homes. Send for it today.

W. B. WILDE CO., *Peoria*, Illinois

We invite correspondence in unoccupied territory



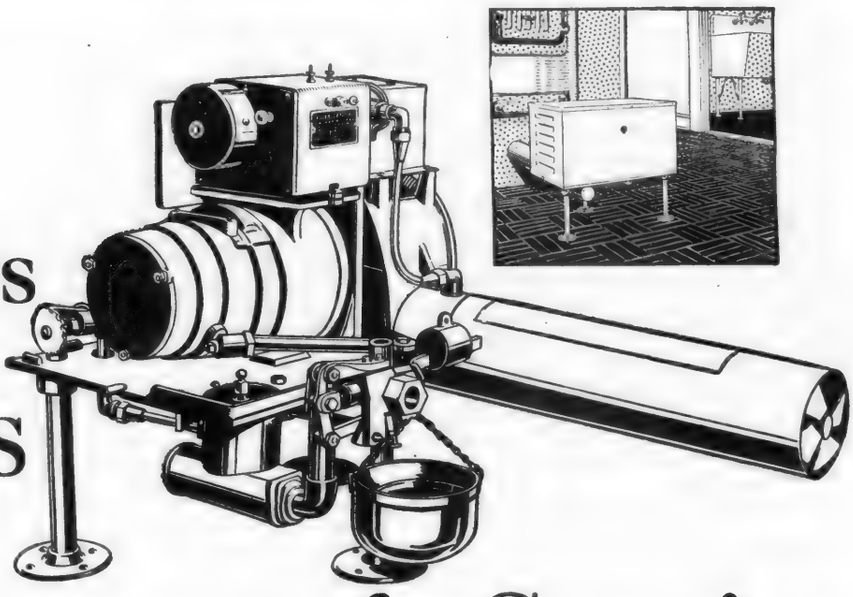
A deferred payment plan offers the customer a special inducement to buy in summer

Hart Electric Icer. A new and highly developed iceless refrigerator for the home

HART OIL BURNER

W. B. WILDE CO.
2137 North Adams Street, Peoria, Illinois
You may send me without cost or obligation:
☐ Special folder on Oil Heating.
☐ Booklet on the Hart Electric Icer.

Name.....
Street.....
City.....State.....



Owners *of* NU-WAYS *make* Few Requests *for* Service

(NU-WAY *is* SIMPLE)

Nu-way is the simplest burner of its type —fewer joints, no diaphragms, fewer moving parts. This simplicity is just as important to the man who sells and services the burner as it is to the home owner.

Every service call eats into the profit made in the original sale. So sell the simplest burner—the simplest that burns oil according to the four fundamental laws governing the perfect combustion of oil.

Many Sales Features

Simplicity means also a lack of noise and of vibration, less wear and longer life. Other features are a timed ignition system that insures the instant ignition of the oil —no back-fire; two automatic protective devices that shut off the oil if anything interferes with either fire or burner; special parts made by leaders in their fields; and four sizes that broaden the field of sales possibilities.

Write for Plan

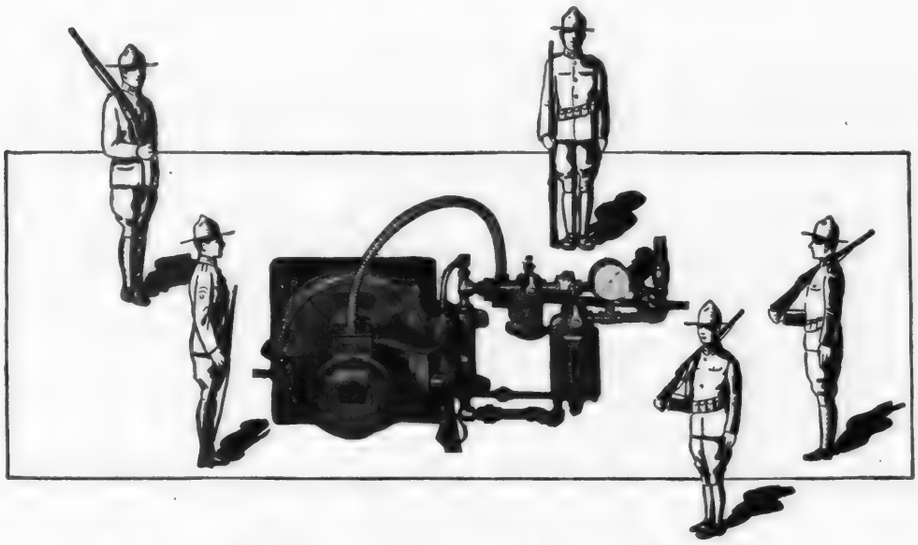
A request, on your own letterhead, will bring you our selling plan; our booklet, "Home Heating A Pleasure"; prices; and details of our ideal financing plan. Territory is being assigned rapidly to reliable agencies—so act at once.

THE NU-WAY CORPORATION
ROCK ISLAND, ILLINOIS

Nu-way

An **AUTOMATIC OIL BURNER**

Approved as Standard by Underwriters' Laboratories



Five Alert Sentries Guard the Johnson Automatic — day and night

LIKE tireless sentries always on duty, five positive safety devices guard the Johnson Automatic Oil Burner. These controls are connected in closed circuit. The breaking of the circuit at any point stops the flow of oil to the burner; stops the operation of the motor ..... immediately!

JOHNSON OIL BURNERS©

This improved S. T. Johnson Co. Rotary Burner, recently equipped with full automatic control, is our greatest achievement in twenty years of successful oil-burner manufacturing. Famous Johnson quality throughout ... every unit "*Built Like a Watch.*" ¶ The pioneer S. T. Johnson Co. Oil Burner is pronounced by engineers, "The most scientifically-constructed burner on the market." Compact, efficient, economical, safe.

S. T. JOHNSON CO.

OIL BURNERS

TRADE MARK REGISTERED

FOR EVERY SERVICE

Main Office and Factory: 940-950 Arlington Street
OAKLAND, CALIFORNIA

Factory Branch Offices: San Francisco, Sacramento Philadelphia

Distributors and Dealers Throughout the United States and in Foreign Countries

9-526

A Complete Line for Every Purpose

There is a size and type of Johnson Burner for every heating and power need. Thousands are giving satisfactory service in every type of building ... from New England to California ... from Florida to the Pacific Northwest ... and in foreign lands.

Some Territory Still Available for a Few Dealers

D. E. 5-26

S. T. JOHNSON CO.
940-950 Arlington St., Oakland, Calif.

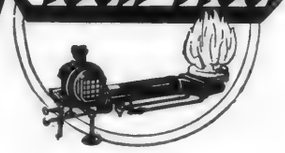
Please mail new booklet describing your improved Rotary Oil Burner with Full Automatic Control.

Name _____

Address _____

ENGINEERED TO A STANDARD BUILT COMPLETE AT THE FACTORY

Kleen-Heet



Why—

"The Choice of the Well Informed"

To the understanding eye of the technically trained man, the engineering superiority of the Kleen-Heet oil burner is marked. Such a marvel of fine simplicity! Instantly efficient! Fool-proof! Trouble-free!

For Kleen-Heet is accurately "engineered to a standard"—the standard of perfect, automatic, economical *home* heating. Thus, it provides a size for every need. And it is self-contained—"built complete at the factory" under the engineers' eyes. Its efficiency does not depend upon complicated installation. Thus, labor and service costs are reduced to a minimum!

That is why Kleen-Heet has so remarkable a record of unfailing performance—in homes of every size—through more than six years.

And why Kleen-Heet is so outstandingly "the choice of the well informed".

Some desirable territory is still available for dealers. Write or wire for profit-making proposition!

Winslow Boiler and Engineering Co.

208 South La Salle Street, Chicago

KLEEN-HEET

With Oil

TESTED AND LISTED AS STANDARD BY THE UNDERWRITERS' LABORATORIES

POCKET-BOOK TALKS

TRULY, as money, I am only half your value, but when it comes to buying coal for heating I can purchase 2,000 pounds of No. 1 Buckwheat, that may be burned in a Newport Boiler delivering just as much heat from each pound of fuel as may be expected from the larger sizes.

RIGHT YOU ARE—2,000 pounds is all I can buy when spent for the aristocratic larger sizes of coal, required for use in ordinary surface feed boilers. My, it is wonderful the savings, Newport Boilers. make possible.

NEW YORK COAL QUOTATIONS - APRIL 1, 1926.

You realize
Mr. Heating Contractor:---

That these simple pocket-book talks are positive facts. A heater offering Economy, Convenience, Uniform Heat, for long periods without attention and one which is adaptable to all sizes and kinds of fuel—coal, coke, or oil, is what your prospects want. Their heating plant demands have consistently changed with modern day progress, and depend upon your good judgment to make the proper selection.

Newport Boilers — meet the most exacting requirements. Your prospects will receive the same benefits enjoyed by thousands of other users for the past fourteen years.

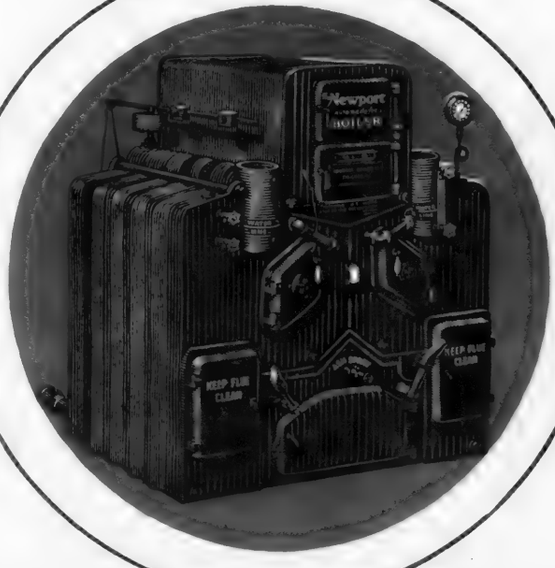
Start now — figure them on every job and grow with the ever increasing demand for this modern boiler.

NEWPORT

BOILER COMPANY - CHICAGO, ILLINOIS

529 SOUTH FRANKLIN STREET

Magazine Feed



Oil Burning

WE INVITE CORRESPONDENCE — FROM DEALERS, JOBBERS AND RESPONSIBLE SALES REPRESENTATIVES

BEAR IN MIND NEWPORTS ARE NOW WITHIN THE MEANS OF ALL— THEY ARE MODERATELY PRICED.

The Astonishing Simplicity of the HI-LO OIL VAPOR BURNER

Marks an Epoch in Oil Burner Construction and Efficiency.

Desirable territory still open to responsible dealers. Send for catalog and dealers' plan.

THE HI-LO OIL VAPOR BURNER operates with absolute certainty, without intricate machinery and embodies simplicity of construction that makes it thoroughly understandable to anyone in ten minutes time. It is made up of so few parts that by very simple mechanical and natural laws it will meet every demand of the modern oil burner.

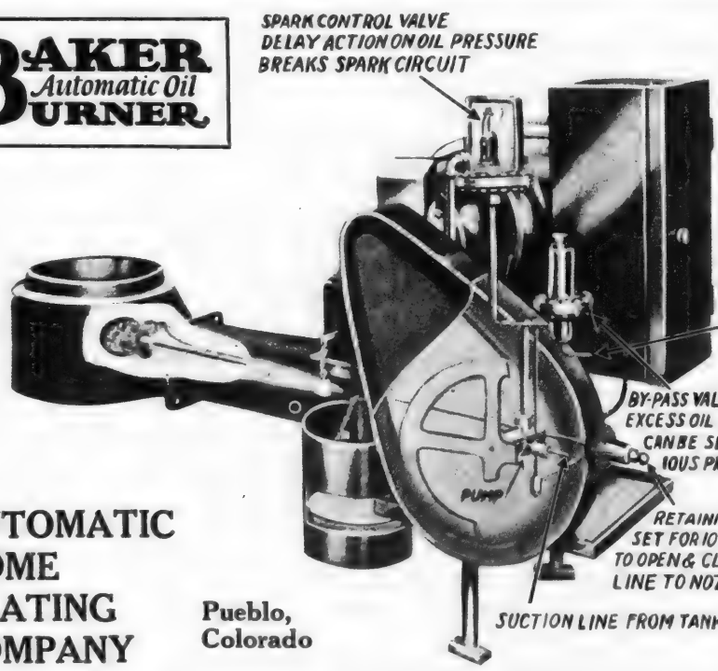
The HI-LO feature increases or diminishes the heat automatically as required without nerve racking ignition explosions or ignition failures. It always provides some degree of regulated heat in accordance with weather conditions.

GLORIA LIGHT COMPANY

110-122 N. May Street, Chicago, Ill.

Our Success Is Due—

BAKER *Automatic Oil* **BURNER**


SPARK CONTROL VALVE DELAY ACTION ON OIL PRESSURE BREAKS SPARK CIRCUIT
RETURN LINE TO TANK
BY-PASS VALVE RETURNS EXCESS OIL TO TANK CAN BE SET AT VARIOUS PRESSURES
PUMP
RETAINING VALVE SET FOR 10 PRESSURE TO OPEN & CLOSE OIL LINE TO NOZZLE
SUCTION LINE FROM TANK

to the efficiency of our burner. Perfect combustion is accomplished by our patented features covering method of burning the oil. The air-cooled combustion chamber is an exclusive Baker feature.

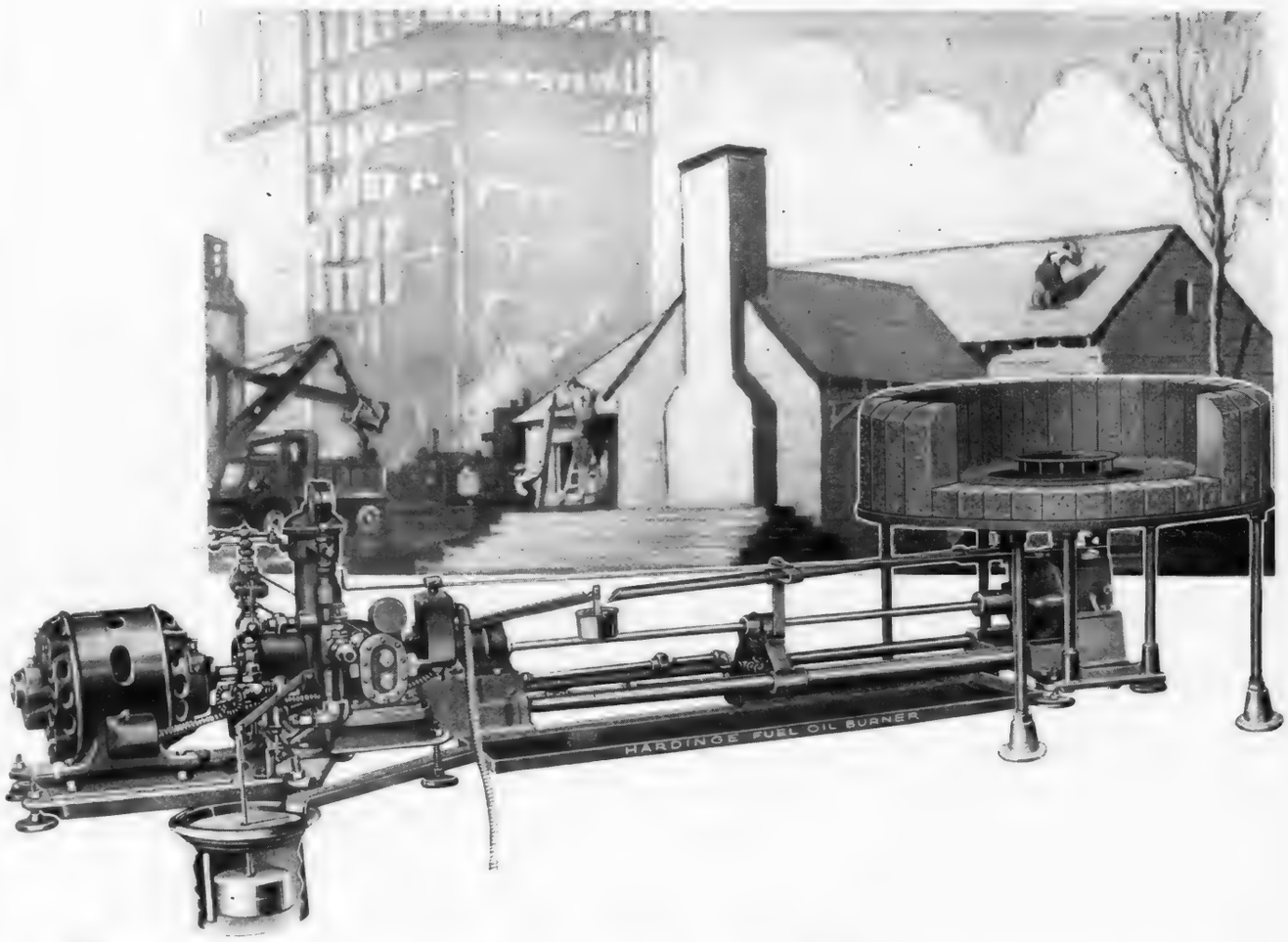
A FORCED-draft of preheated air enters the fire-pot opposite the oil. Like a strong wind against the stream of a lawn sprinkler, the air blows the oil into a fine mist, in which form the combustion takes place. The result is total consumption of the oil and highest—

efficiency, economy and regularity of heat.

AUTOMATIC HOME HEATING COMPANY

Pueblo, Colorado

Limited and Profitable Territory Open to New Dealers.



from Bungalow *to* Skyscraper

Hardinge Fuel Oil Burners are used successfully on all types of buildings —from the small bungalow to the mammoth skyscraper. That's one of the reasons why Hardinge dealers are kept busy the year 'round.

There are several reasons why conscientious dealers insist on the Hardinge. Some of them are:

The Hardinge is guaranteed for ten years. Both domestic and industrial burners are listed as standard by the Underwriters' Laboratories and the Board of Standards and Appeals of New York. The Hardinge is economical, practically noiseless and dependable. It is manufactured by a concern whose name and products are known throughout the world.

This is especially important to dealers. Nowhere in the Hardinge contract will you find definite specifications relative to the number of burners to be purchased with the signing of the contract. Dealers are not required to order any definite number of burners, as the burners will be shipped only as required. We invite those who can qualify to join the ever-increasing list of Hardinge dealers.

HARDINGE BROTHERS, INC., 4149 Ravenswood Ave., Chicago

HARDINGE

FUEL OIL BURNER

A "Made-to-order" Proposition

Dealers with the double franchise for the Combustion Fuel Oil Burner and Milwaukee Air Power Water System have a made-to-order proposition. Two great leaders. Big sales opportunity every month in the year.

The Combustion opens two great sales fields—domestic and industrial heating. This burner is built on the same principles which have proved so highly successful for over 30 years in the U. S. Navy and for industrial uses. Nozzle type. Simple. Safe. Dependable. Burns genuine fuel oil. Thousands installed in six years.

The Milwaukee Air Power Water System for 15 years has been first choice of those who want the finest. Gives complete, high pressure water service direct from well, spring, lake and cistern. No water storage tank. Capacities 100 to 5,000 gal. per hour. A big seller all through the quiet oil burner months.

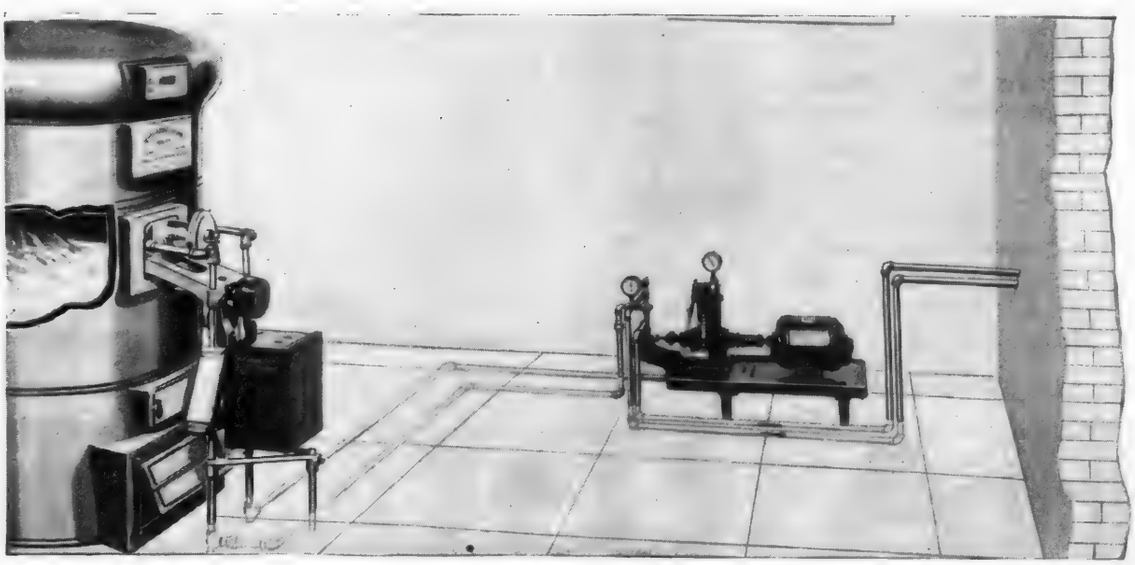
Write today for complete facts about our double franchise.

COMBUSTION FUEL OIL BURNER CO.
13 Keefe Ave. Milwaukee, Wis.
Subsidiary of Milwaukee Air Power Pump Co.

The Combustion Fuel Oil Burner

Outstanding Sales Features

1. A truly automatic system burning genuine fuel oil. Suitable for domestic or industrial use. Nozzle type—the same principle used in steel mills and by U. S. Navy for many years. Insures utmost atomization and combustion.
2. Manufactured since 1919. Thousands in use all over the country. A safe, dependable burner.
3. Quiet in operation.
4. No smoke, dirt or odor when properly adjusted. No labor required.
5. Many less parts than any other completely automatic oil burner; only 3 moving parts, motor, compressor, oil pump.
6. Automatically self-lubricating.
7. No complicated clock mechanism, gears, cams, levers, rods or drip cans.
8. No alteration to boiler of furnace required.
9. Flooding with oil is impossible. Perfect control of fuel; flows only when needed.
10. Oil flow is governed by air or pump pressure. Stops when motor stops.
11. Very low pressure is required. Perfect control, high pressure impossible.
12. Built with pump unit or with service tank.
    Tank, motor and pump can be installed in any convenient part of basement. Gas or electric ignition, economizer provided on all gas fired units.
13. All pipes are small and may be installed under the concrete floor.
14. Insures a high degree of heating efficiency.
15. Listed as Standard by the Underwriters' Laboratories.

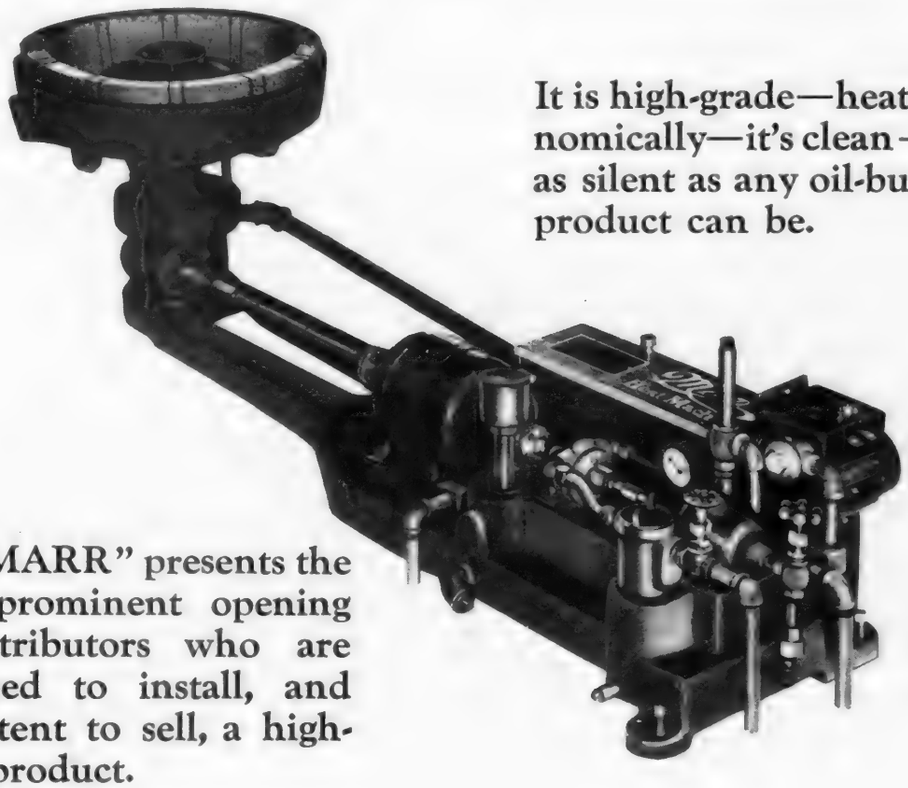


Installation of Combustion Fuel Oil Burner, Pump unit type

THIS IS THE INCOMPARABLE

Marr Oil Heat Machine

U. S. Pat. No. 1158058, Oct. 26, 1915



It is high-grade—heats economically—it's clean—and as silent as any oil-burning product can be.

The "MARR" presents the most prominent opening to distributors who are equipped to install, and competent to sell, a high-grade product.

IF YOU CAN QUALIFY, WRITE US!

Marr Oil Heat Machine Corporation

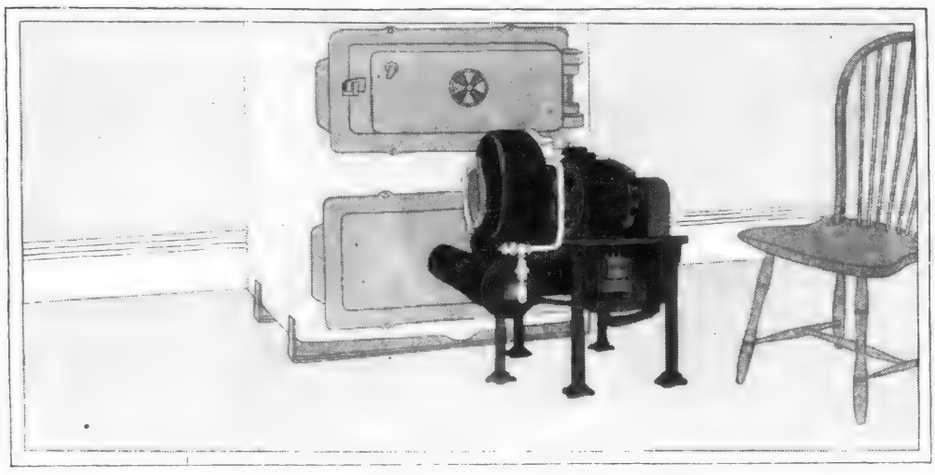
Sole Manufacturers

Listed as Standard by the Underwriters' Laboratories

Listed as Standard by the Underwriters' Laboratories

97 So. 11th Street, Minneapolis, Minn.

Member American Oil Burner Association



How much does an oil burner cost you *after you've sold it?*

When you've made your first profit from the sale of an oil burner, are you free from further expense? Or will you have to give free service at frequent intervals, wiping out nearly all your profits on the original sale?

Quiet May dealers rarely have expense for service, because the Quiet May is a *perfected* oil burner with no complicated machinery to get out of order — built simply, sturdily, *it has only two moving parts.* The result is bigger profits—satisfied customers—and a constant increase in business.

The Quiet May is really noiseless—it eliminates the only objection to oil heat.

These advantages of the Quiet May make for satisfied customers and satisfied customers are the best salesmen you could have.

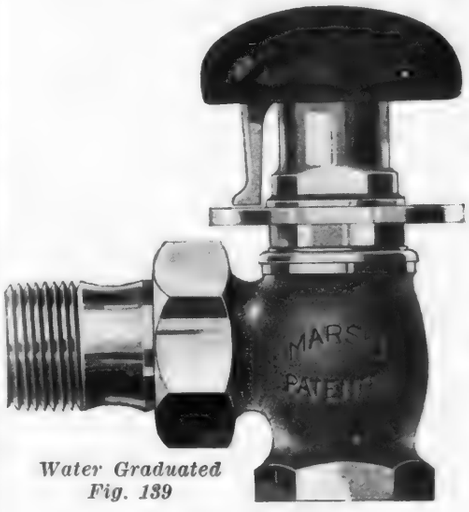
Quiet May dealers profit by our special dealer finance plan and our consumer deferred payment plan. Let us tell you more in detail about these plans and about all the other advantages that result from carrying the Quiet May. A postal will bring you complete information. Address May Oil Burner Corporation, Baltimore, Maryland. Branch Offices, 331 Madison Ave., New York; 1020 Commonwealth Ave., Boston; 2401 Chestnut St., Philadelphia; 503 Security Bldg., St. Louis.

Quiet May

AUTOMATIC

OIL BURNER

Marsh Re-enforced Modulated Cone Disc Radiator Valves

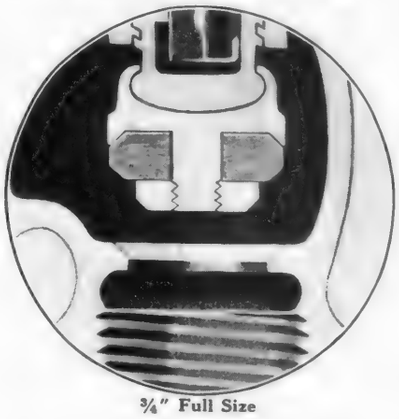


Water Graduated
Fig. 139

This Cone Disc construction combined with the **Marsh Re-enforced Packless Feature** is the last word in completing radiator valve **maximum efficiency** at **popular prices,** all of which will check 100% true upon investigation.

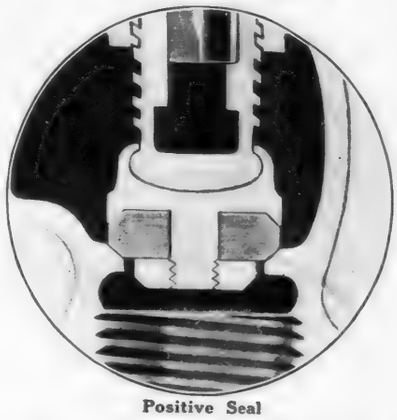
Oval Wheel,
Lever Handle
or
Lock Shield

Fig. 147



¾" Full Size

These Discs
will not crack
or leak
through
valve seat.



Positive Seal

The above views showing cone disc and beveled seat are to **actual size of a ¾" valve** and are made to full size to show the advantages of this construction over the old style flat disc and seat:

The Modulation feature of our Cone Disc Line is the same as with our union bonnet flat disc, Figure 131.

Our Cone Disc Modulated valves unless otherwise ordered are fitted with Oval Wheel, the same as our Graduated Water valve, Figure 139.

With our Oval Wheel Handle you have the same dial and indicator control as with Lever handle and a much stronger and more serviceable CONSTRUCTION than is possible with a Wood wheel, as this composition won't break or split as will wood.

Further, this wheel is removable and interchangeable with our Lever handle, effecting a material advantage to customer in matter of convenience of changing from one to the other on job if for any reason change is desired.

MARSH VALVE COMPANY

DUNKIRK — ***Exclusive Sale Distributors*** — **NEW YORK**

Edward T. Hetherington
1718 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

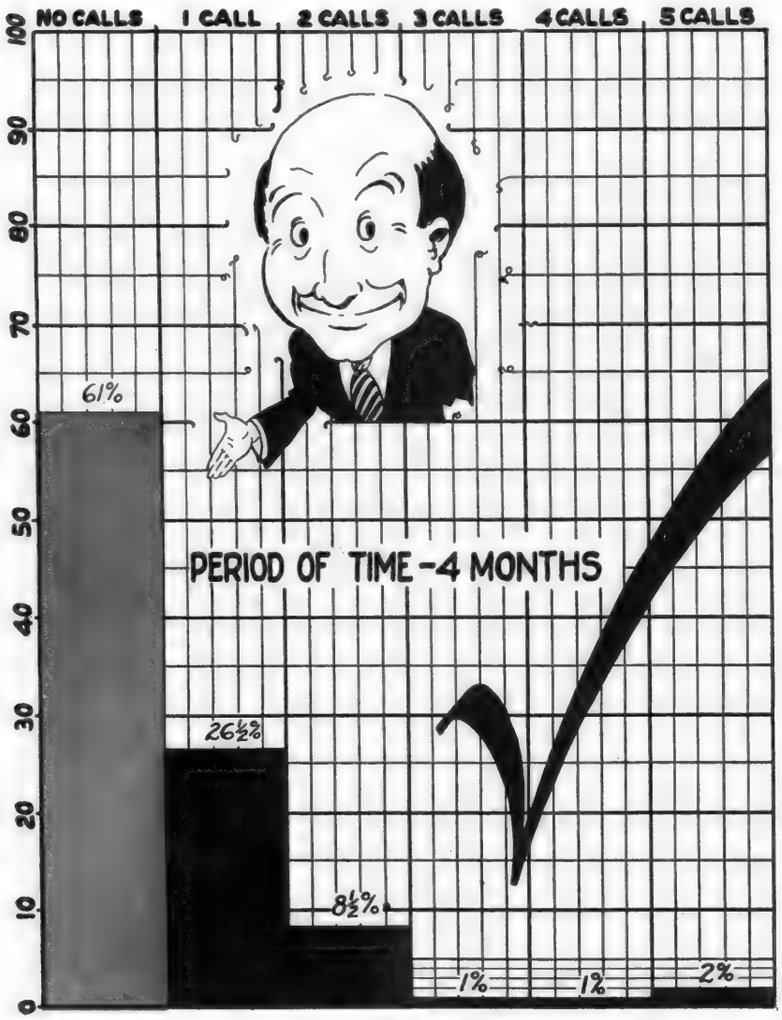
John W. Mabbs,
431 So. Dearborn St., Chicago, Ill.

United States Radiator Corp'n
General Offices: Detroit, Mich.

All territory east of west lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

Jas. P. Marsh & Company
118 So. Clinton St., Chicago, Ill.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County, "Chicago, Illinois."



An ABC

Dealer's Service call record

61% of Burners—No Calls
21½% of Burners—One Call
8½% of Burners—Two Calls

The other calls the dealer classifies as "chronics"—No oil, etc.

Few Service calls—that's one reason why ABC dealers make money

More than one oil burner dealer knows that it is one thing to sell oil burners—but another thing to service them.

ABC is simple—only one moving part that can wear. Service calls are low. Profits are certain.

Listed as Standard by Underwriters' Laboratories

AUTOMATIC BURNER CORPORATION
312 N. May Street, Chicago

ABC OIL BURNER

no noise ~ no carbon

Arco Packless Valves add to the comfort of guests at LA PLAYA HOTEL

Carmel, California

PERFECT performance of heating plants is just as essential in smaller buildings as in the largest. The La Playa Hotel is as fine a small hotel as can be built. So, naturally, when radiator valves were being specified, these five points made the selection of Arco Packless Valves a matter of course.

1 Arco Packless Valves are good looking. They add a finishing touch of smartness to a radiator.

2 They pay for themselves by saving the annual expense of repacking.

3 They prevent leaks—one of which may cost more than all the valves in the building.

4 They add to the comfort of the owner or his tenants. Arco Packless Valves open with one smooth turn.

5 A heating plant deserves accessories that insure perfect performance. Every radiator deserves an Arco Packless Valve.

Arco Packless Valves for steam, water or vapor, are made in angle, corner and globe patterns.

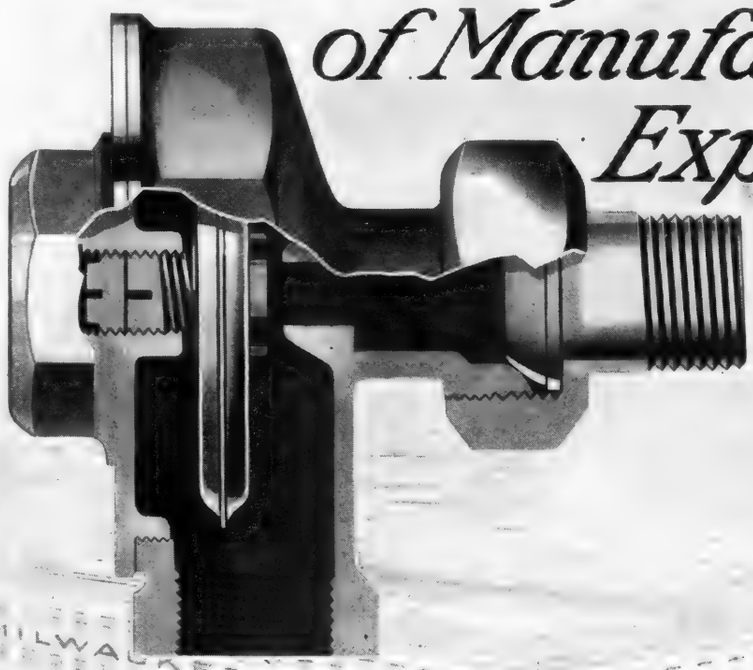
The ARCO PACKLESS VALVE is one of many heating accessories made and guaranteed by

AMERICAN RADIATOR COMPANY

Specialties Department

816 S. Michigan Avenue Chicago, Ill.

Backed by 25 years of Manufacturing Experience



MILVACO

THERMOSTATIC TRAP

Conceived, designed and built to a purpose — the elimination of trap troubles — the ***Milvaco Thermostatic Trap*** embodies in its detail of construction, principal of operation, and accomplishment of purpose, a standard synonymous to the Milwaukee Valve Company.

Backed by twenty-five years of manufacturing experience —A message with a meaning to the discriminating buyer.

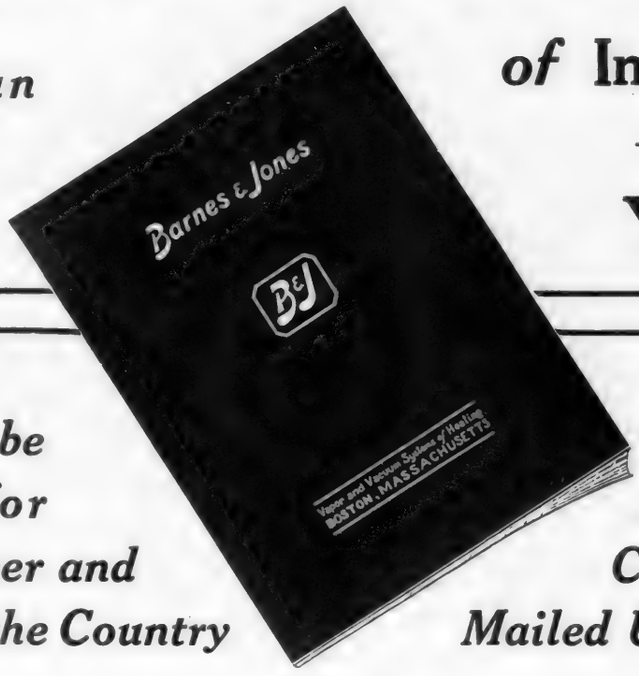
Bulletin No. 23 descriptive in detail of the Milvaco Thermostatic Trap will gladly be mailed you upon request.

MILWAUKEE VALVE CO.

MILWAUKEE, WISCONSIN, U. S. A.

A BOOKFUL

Not Just an Ordinary Catalogue



of Information *—for—* YOU

A Copy will be Available for Every Engineer and Architect in the Country

Off the Press July 10. Your Copy will be Mailed Upon Request

CONTAINS

Summary of installation experiences in Hospitals, Schools, Residences, Hotels, Clubs, Churches, Dormitories, Theatres, Department Stores, Factories, Mills, Industrial Buildings, Office Buildings and Apartment Houses.

The New

Barnes & Jones

CATALOGUE

CONTAINS

Detail drawings of typical connections, pipe size tables and complete information on installations using Modulation Valves, Thermostatic Return Valves, Condensators, Blast Traps, Vent Traps and Strainers.

THIS book is designed for the man who specifies apparatus for Vapor and Vacuum Heating. Every subject is illustrated with photographs or drawings, and many of these illustrations are taken from actual installations. Bound limp to fit in the pocket, convenient when folded, and of standard "letter-head" size so as to fit the letter files in your office, it is indeed a serviceable book. Your copy will be mailed without charge or obligation upon request from you. Write TODAY.

Vapor *and* Vacuum Heating Systems *of* Proven Quality

Barnes & Jones

Representatives in Principal Cities

5 Melrose Street, Boston *300 Madison Ave., New York City*

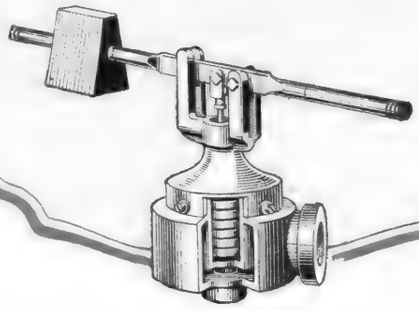
Thrush Features!

1 Only six feet of pipe and eight fittings required to make complete installation.

2 Provides automatic control of dampers giving uniform room temperatures and saving fuel.

3 Maintains a slight additional pressure on the system which increases heat transmission. That means more heat with less fuel.

4 Thrush Pressure Tank conserves hot water, lessens scale deposits in boiler and goes in the basement out of the way where it can't freeze.



Simple ....to install!

Thrush success is sweeping the country. Dealers like it because it is so simple and inexpensive to install on any type of hot water heating plant. Only six feet of pipe and eight fittings needed. It makes a closed system automatically regulated from any gravity job. Tank goes in the basement where it cannot freeze. Great fuel savings, dependable operation and uniform heating assured to customers. Find out more about it NOW!

H. A. THRUSH & CO.
Peru, Indiana

———————19———

Gentlemen:

Send me your illustrated catalogue and price list. I am interested in Thrush System of Hot Water Heating.

*My Jobber Is*_____

*My Name*_____

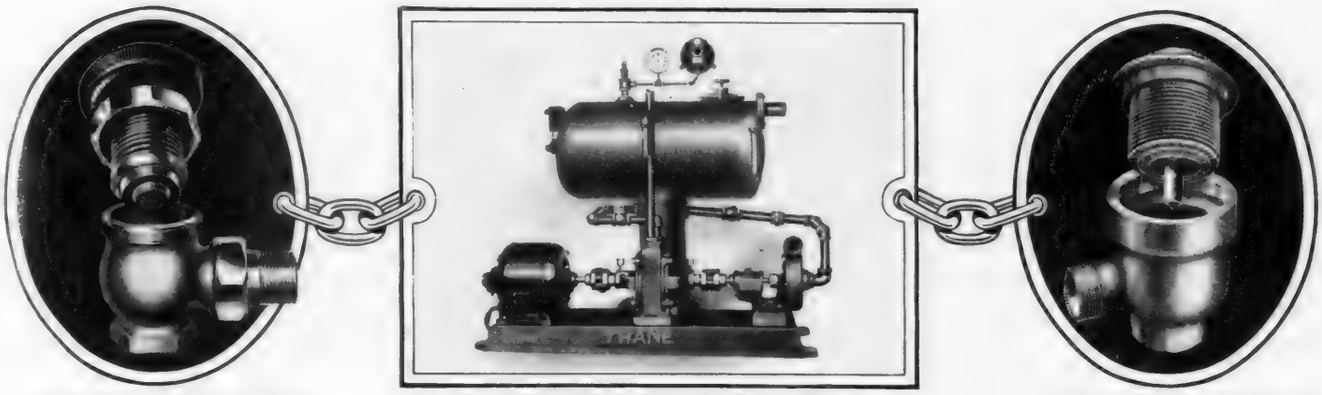
*My Address*_____

H. A. THRUSH & COMPANY

Peru-Indiana.

Mail the Coupon...Now

Thrush System of Hot Water Heating!



Trane Bellows-Packless Valve *Trane Standard Return Line Vacuum Pump* *Trane Bellows Radiator Trap*

Trane Undivided Responsibility Heating in Sherman Square Apartments, New York City

This advertisement is No. 4 of the Trane Undivided Responsibility Series.

American Bond and Mortgage Company, underwriters
Longacre Engineering & Construction Company, builders
Herman M. Sohn, architect
W. A. Flynn, heating engineer
Charles H. Darmstadt, Inc., heating contractors
Mark Rafalsky & Company, building managers.

The Sherman Square Apartments is said to be one of the most beautiful apartment houses in New York City. It is of fireproof construction, fifteen stories in height with pent house and basement. No expense was spared to make it an achievement in this class of construction.

It has 140 suites for housekeeping apartments of the highest type.

The building is heated with a Trane Undivided Responsibility Vacuum System. There are 654 radiators equipped with Trane Bellows Traps and Trane Valves, served by an R3010 Trane Return Line Vacuum Pump.

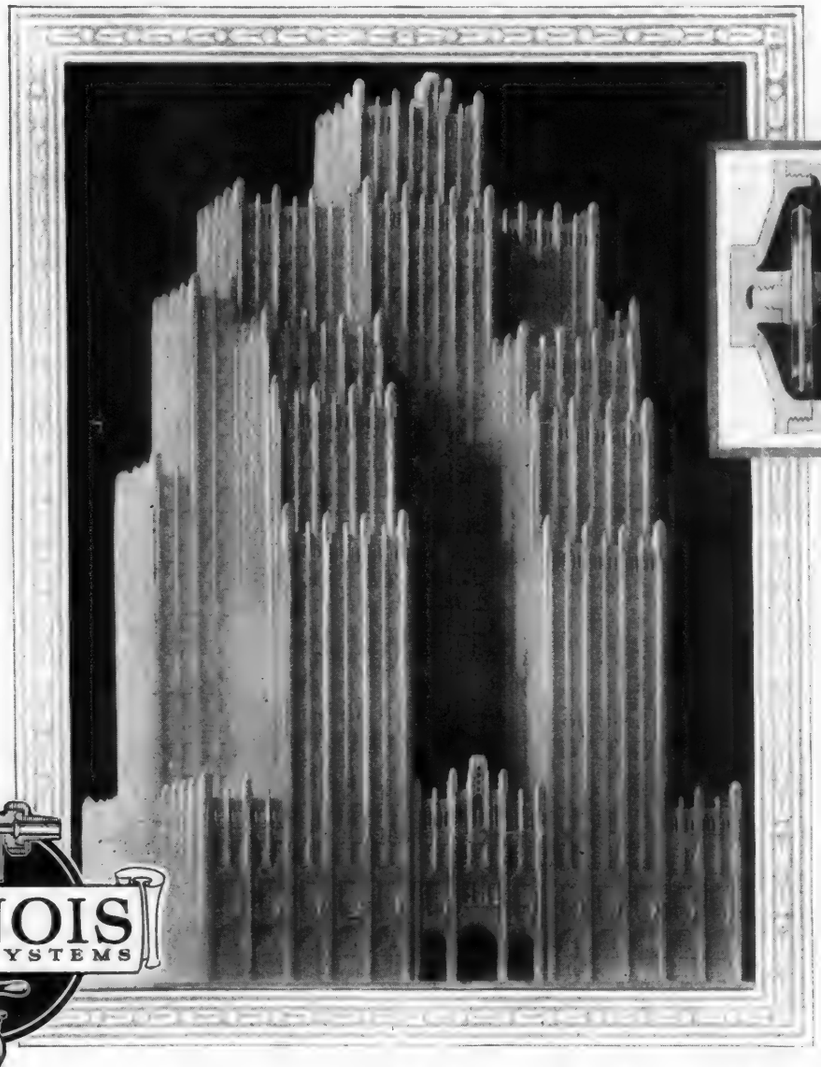
The superintendent in charge of the heating installation says that the plant was turned over without a hitch—just made steam and threw in the switch; that's all there was to it.

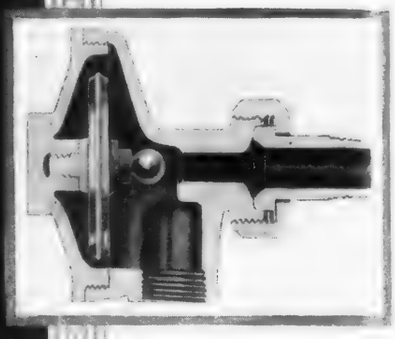
The designing engineer says it is a very fine job of heating.

The building managers state that the heating has proved satisfactory during all the working operation since it was installed.

And so here again is shown the desirable results of placing *all* heating responsibility directly upon the shoulders of the one company that makes a complete line of not only heating specialties but highest grade pumping equipment as well. It's a great combination—try it and see.

The Trane Company, 208 Cameron Ave., La Crosse, Wis., manufacturers of vapor and vacuum heating specialties and pumps. Branches and sales connections at New York, Chicago, Boston, Cincinnati, Newark, Philadelphia, Buffalo, Cleveland, Detroit, Seattle, Los Angeles, Albany, Minneapolis, Salt Lake City, Greensboro, N. C., Zanesville, Ohio, Tampa, Fla., Baltimore, Md., Des Moines, Ia., New Haven, Conn., Sheboygan, Wis. In England: 22-23 Clerkenwell Close, London, E. C. 1. In Canada: The Trane Co., 21-23 River St., Toronto, 2; Thomas Robertson & Co., 134 Craig St., West, Montreal: F. S. Murdoch, 310 Breadalbane, Winnipeg; A. B. Madden, 48 Sparks St., Ottawa. In China: C. J. Doughty & Co., 7 Jinkee Road, Shanghai.





ILLINOIS THERMO TRAP

Administration Building
Southwestern Bell
Telephone Company
St. Louis, Mo.
(1218 Radiators)

Mauran, Russell & Crowell,
Architects

I. R. Timlin,
Associate Architect

H. H. Morrison,
Consulting Engineer

American Plumbing and
Heating Co.
Heating Contractors

ILLINOIS
HEATING SYSTEMS

Quality is Worth Its Price

THE far-seeing, master minds that conceived this majestic structure know that Quality is Worth Its Price. To insure the utmost in heating comfort and satisfaction they took the precaution to specify an ILLINOIS Vacuum System. ¶ To every notable architect and engineer ILLINOIS HEATING SYSTEMS is a familiar name. They know of the overwhelming evidence of satisfactory installations—of faultless performance—of satisfied owners. ¶ ILLINOIS HEATING SYSTEMS are largely preferred by architects and consulting engineers—whose discerning judgment can be safely accepted as a criterion.

EVERY Architect Should Have Bulletin 21

REPRESENTATIVES IN 40 CITIES OF U.S.A.

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD President INCORPORATED 1900

CHICAGO

NO MORE RADIATORS

The HEAT CABINET

Patents Pending.

The Heating Unit is placed in the lower part of the Cabinet, as illustrated. It is made up of copper fins placed upon a U-tube by a patented process. Due to this process the fins are kept at a temperature very near the temperature of the U-pipe itself.

Air passing through these fins, up through the Cabinet, gains great velocity due to its expansion after passing over the heated surfaces.

The operation of the Heat Cabinet, therefore, depends almost entirely upon convection, and the amount of heat given off is easily regulated by controlling the amount of air that is allowed to pass through the heater. This result is accomplished by means of the simple damper arrangement shown, thus giving for the first time absolutely perfect heat control on all modern types of heating systems where radiators in the past have been used.

Heat Cabinets are being made in a wide range of sizes and styles for both visible and concealed locations.

LA CROSSE TRADE TRANE MADE WISCONSIN

Heat Cabinets!

Cabinets of heat. Pretty things; a part of the furniture. Artistic, light, efficient, economical; a welcome successor to the unsightly radiator!

Sturdy heat cabinets. Made of metal to last forever. Yet light of weight. A husky little boy can handle one. Made for steam, for vapor, for vacuum, for hot water. Made for big rooms, little rooms; for public buildings, for private homes; visible or concealed.

Costs not announced, but they will be low. The successor to the radiator must not cost more than the shielded radiator it succeeds, even though it is made of copper and brass instead of bulky iron.

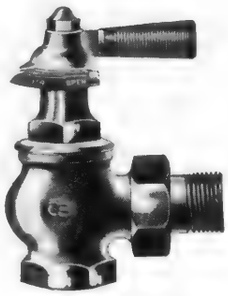
Delivery in September. Not adequate delivery, of course, but still enough to take care of most urgent demands.

Literature now. Some color work has already been distributed. Additional test data and other information is ready. Those who submit their names are being kept up with the times.

Questions welcome. Inquiries should be addressed directly to the main office.

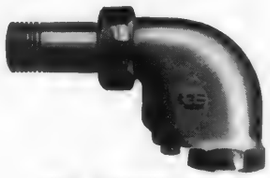
THE TRANE COMPANY, 206 Cameron Ave., La Crosse, Wis., U. S. A.

THE SUCCESSOR TO THE RADIATOR

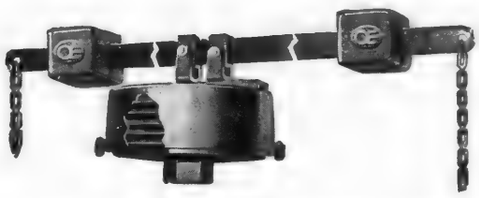


O-E Improved Perfect Packless Graduated Supply Valve.

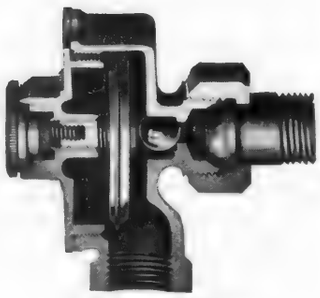
O-E Improved Air Exhauster and Vacuum Valve



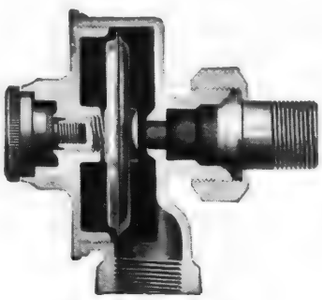
O-E Improved Perfect Ball Check Water Seal Return Fitting.



O-E All Metal "3 in 1" Combination Damper Regulator.



O-E No. 2 Thermo-Nickel Return Trap.



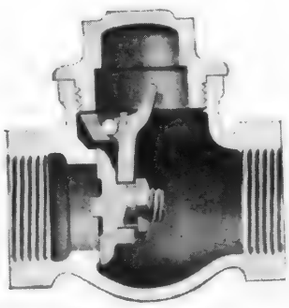
O-E No. 1 Thermo-Nickel Return Trap.

3-in-1

Heating Specialties

form the simplest and most flexible heating system ever devised. Operating on the thermos bottle principle, it provides VAPOR part of the time—VACUUM most of the time—PRESSURE when desired. Let us send you positive proof of the way in which the O-E System has enabled heating engineers to solve expeditiously and economically requirements of their clientele.

Snd for Complete Catalogs.



O-E Rouse Type Balanced Swing Check Valve.

O-E Direct Differential Return Trap.

O-E SPECIALTY MFG. CO.
12 Keefe Ave. Milwaukee, U. S. A.

O-E Compound "3 in 1" Gauge.

THE SEAL OF SIMPLICITY

3 in One Heating

combines the advantages of

VAPOR-VACUUM-PRESSURE

The HERMAN NELSON *Invisible* Radiator

No longer need the architect, the interior decorator and house owner resort to ornamental boxes, radiator covers or screens, which use extra space, involve inconveniences of control, result in more or less unsanitary conditions, and reduce the heating capacity of radiators.

The Herman Nelson *Invisible* Radiator renders all such makeshifts obsolete. Only 3½" deep, it is about one-eighth the size, and one-tenth the weight of ordinary radiators; so small that without furring it can be set in any 4" wall, occupying no space in the room—out of sight and out of mind.

For the Herman Nelson *Invisible* Radiator is built of indestructible materials, on entirely new principles; it will not leak, rust, wear out, or burst even when frozen.*

Literally invisible—taking up no wall or floor space; it allows full scope for all architectural design and removes all limits to decorative and furnishing plans. Write for the vitally interesting facts about the Invisible Radiator, that ushers in a new era of home beauty, convenience and comfort.

*The Herman Nelson *Invisible* Radiator has been in use for several years in all parts of the country, where temperatures frequently reach 20° to 40° below zero.

HERMAN NELSON *Invisible* RADIATOR
TRADE MARK

THE HERMAN NELSON CORPORATION, *Moline, Ill.*

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BOSTON	SCRANTON	COLUMBUS	MILWAUKEE	KANSAS CITY	PORTLAND
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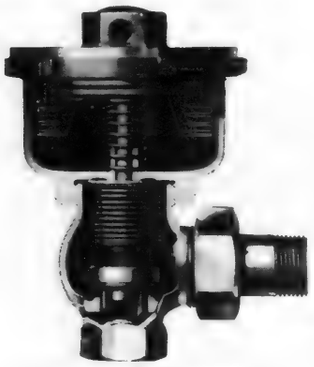
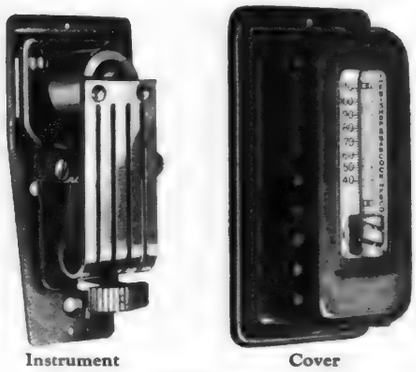
NEW YORK CITY	GRAND RAPIDS	INDIANAPOLIS	ST. LOUIS	SALT LAKE CITY	VANCOUVER
SYRACUSE	DETROIT	CHICAGO	EMPORIA	SAN FRANCISCO	TORONTO

Exact----throughout the years



Bishop & Babcock
Multiflex Pnuematic Valve



Instrument Cover

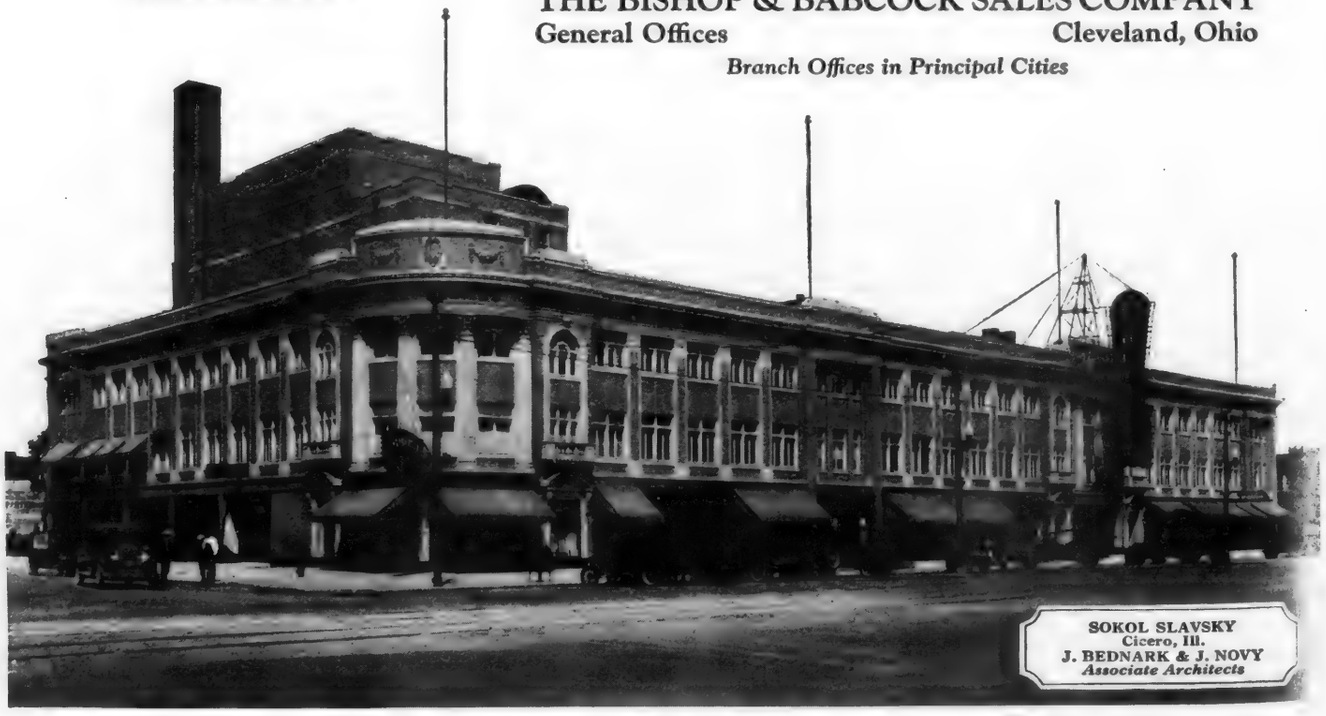
Bishop & Babcock
All-Metal Thermostat

HUNDREDS of installations, many of which have been in constant use for more than 10 years—in schools, churches, hotels, office buildings, apartments and other large buildings—attest to the popularity and serviceability of Bishop & Babcock Temperature Control Systems.

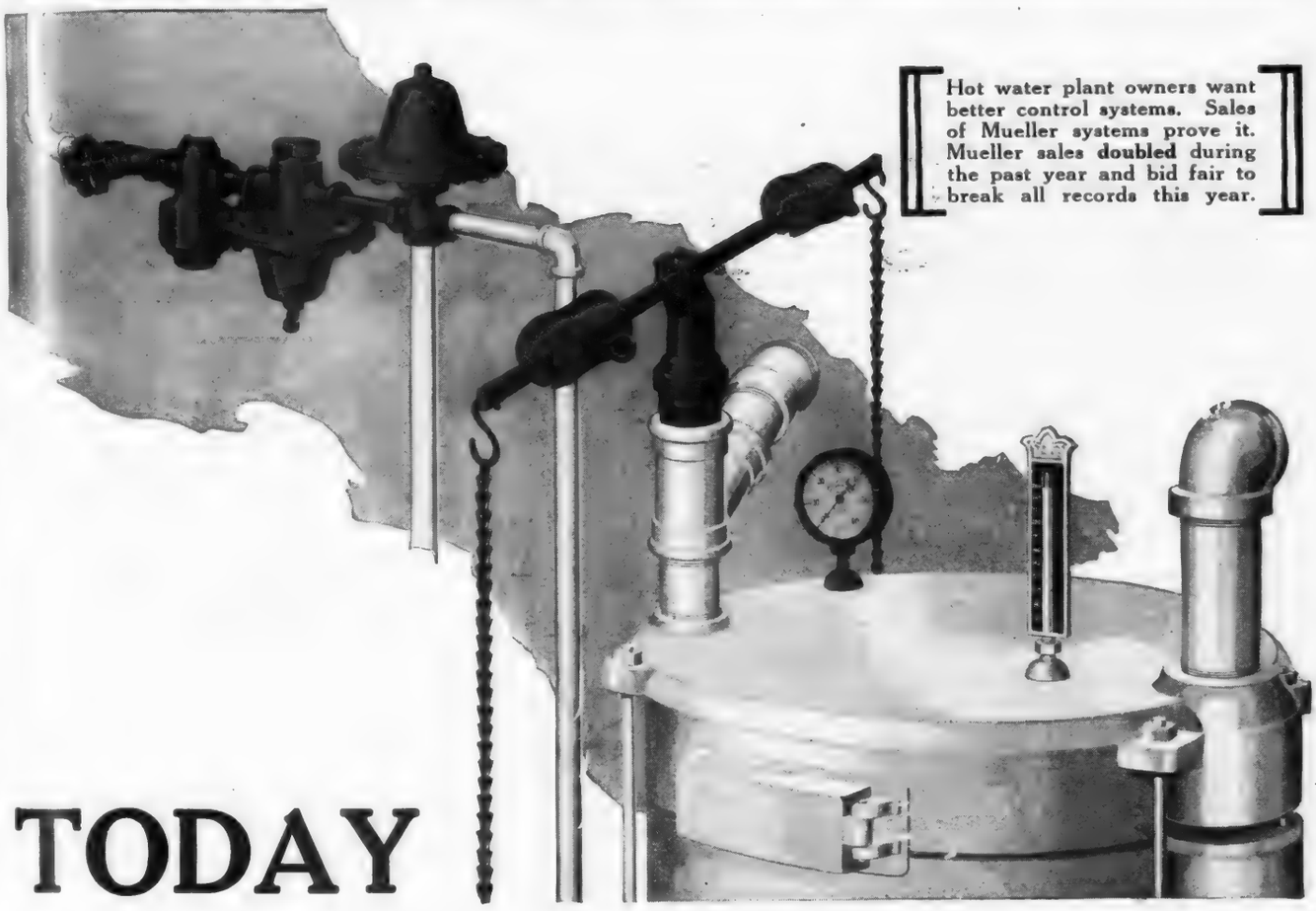
Bishop & Babcock Temperature Control Systems are complete, efficient and economical. Architects, Heating Contractors and Engineers are invited to call upon our Engineering Department for suggestions and data concerning Temperature Control Apparatus.

Our Engineering Data Book, pocket edition, will be mailed on request. A new catalog and data book covering Massachusetts Fans and Blowers is just off the press—shall we mail you a copy?

THE BISHOP & BABCOCK SALES COMPANY
General Offices **Cleveland, Ohio**
Branch Offices in Principal Cities



BISHOP & BABCOCK
TEMPERATURE REGULATION



Hot water plant owners want better control systems. Sales of Mueller systems prove it. Mueller sales **doubled** during the past year and bid fair to break all records this year.

TODAY —what chance has the expansion tank?

What chance has the bulky expansion tank—that allows the water to evaporate or boil—or that freezes in the attic—or crowds the clothes closet—or ruins the appearance of the bathroom—or becomes "waterlogged" in the basement? What chance, when the compact, efficient Mueller system gives better control, better heating, and saves fuel, besides?

Why should **you** install the Mueller system?

Because you want owners to be pleased with hot water plants. Because satisfied customers build more sales. Because the Mueller system is live heating merchandise—carries a good margin for you; can be installed at a great saving of labor on both old and new jobs; gives the customer a better job at no greater cost than the obsolete expansion tank system.

What chance has the expansion tank in the face of the popular demand for more modern, more dependable control? The Mueller system gives owners the most highly developed automatic hot water heat control. Plenty of these systems have been in operation long enough to prove their absolute dependability.

Let us send you our special booklet describing this system in detail. Write today.

More than ever before, hot water plant owners will demand this automatic, fuel-saving system of control. Anticipate **your** needs now! Plan to get **your** share of this desirable business. Order early and be prepared.

MUELLER CO.

(ESTABLISHED 1857)

Factories: Decatur, Illinois; Port Huron, Michigan

Canadian Factory
MUELLER, Limited, Sarnia

Branches
New York, San Francisco, Los Angeles

MUELLER

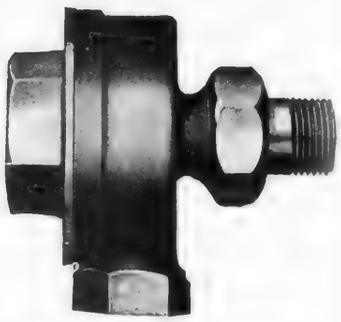
Automatic Heat Control System

284

Sterlco
TRADE MARK

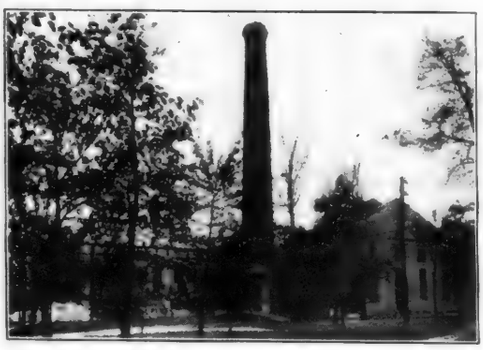
NEW HOSPITAL

MAIN BUILDING



STERLCO THERMOSTATIC TRAP

A few of the 40 buildings comprising the Northwestern Branch National Home for Disabled Volunteer Soldiers, at Milwaukee, Wis., where uniform temperatures must be maintained day and night. Sterlco Thermostatic Traps and Packless Radiator Valves have given satisfactory and efficient service on over 4000 units of radiation throughout the past four years.



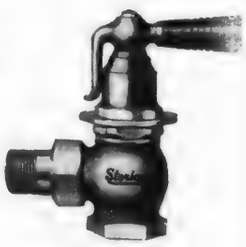
POWER PLANT

ADMINISTRATION BUILDING

STERLING ENGINEERING COMPANY

1626-36 HOLTON STREET
MILWAUKEE, WISCONSIN

THERE IS A STERLCO REPRESENTATIVE IN YOUR LOCALITY



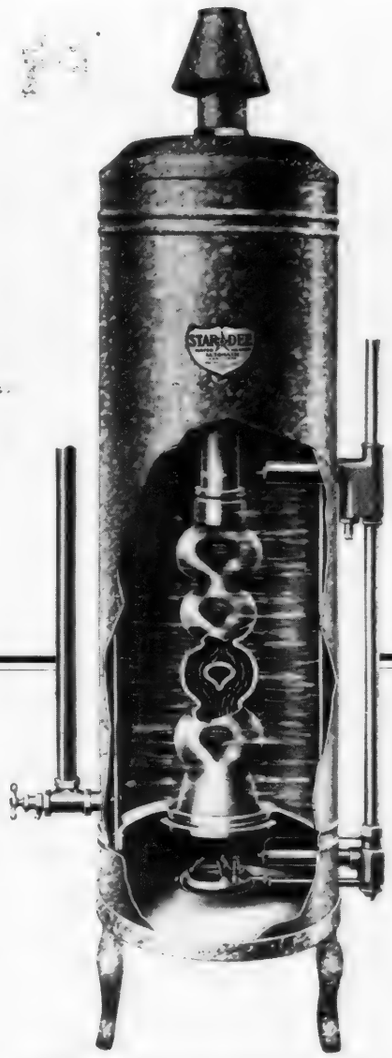
STERLCO GRADUATED PACKLESS VALVE

STAR DEE

is

equipped with

Barber Patented Jet Gas Burners



STAR DEE Automatic Water Heater is the very substantial product of the Detroit Range Boiler & Steel Barrel Company.

In the Star Dee are united the three vital elements —Safety—uninterrupted Service and Economy.

Naturally, the important adjunct to the proper functioning of any heater is the Burner.

Knowing this, the manufacturers of the Star Dee selected the BARBER BURNERS. Their selection was based on their knowledge of these burners; knowledge reached after careful tests.

Among the many interesting features—as well as highly desirable ones, are: Low consumption of gas —retaining that hot blue flame; No back-firing; No carbonizing; No adjustment—regardless of the quality of gas; and No servicing.

Manufacturers of gas appliances will find us ready to subject their appliances to accurate tests in our well-equipped laboratory at no expense to the manufacturer in the effort to attain a greater degree of efficiency through the use of Barber Jet Burners. Tell us your problems and we will strive earnestly for a correct solution. Our descriptive literature and prices of Barber Jet Burners will be mailed on request.

Among the many Heater Manufacturers who have adopted and are using "Barber Patented Jet Gas Burners" are the following:

American Radiator Co.
Barton-Roth Co.
Bastian-Morley Co.
Bryan Steam Corp.
Coast Heater Mfg. Co.
Day & Night Water Heater Co.
Detroit Range Boiler Steel Barrel Co.
Geneva Heater Co.
Gewert Mfg. Co.
Hoffman Heater Co.
Hotstream Heater Co.
Edw. Katzinger Co.
Lovekin Water Heater Co.
Melrose Water Heater Co., Inc.
The New Way Mfg. Co., Inc.
Piatt Water Heater Co.
Sands Mfg. Co.
Simplex Heater Co.
Snap-O-Stat Co.
Southard Robertson Co.
Superbo Water Heater Co.
Superbo Mfg. Co.
Welsbach Co.
Walter Mork Heater Co.

The CLEVELAND GAS BURNER & APPLIANCE CO.

Burner Specialists

3702-04 Superior Avenue, Cleveland, Ohio

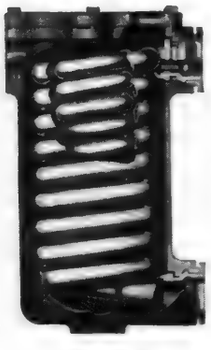
EXCELSO Triple Coil Indirect Heater. Top View, Capacities 600 and 800 gals.

DOMESTIC HOT WATER

for Big Buildings

Supplied by Connecting Excelso Heater to Heating Plant

APARTMENT houses, office buildings, hotels, clubs—wherever *large quantities* of hot water are used—specify the connection of the Excelso Indirect Water Heater to the steam or vapor heating boiler.



EXCELSO Double Coil Indirect Heater. For Larger Steam and Vapor Boilers. Capacity from 160 to 400 gals.

For One Family or One Hundred Families

The larger sizes of Excelso Heaters, double and triple coil, serve capacities up to 800 gals. —using the same fire that warms the building to heat domestic hot water.

Write us for specification literature.

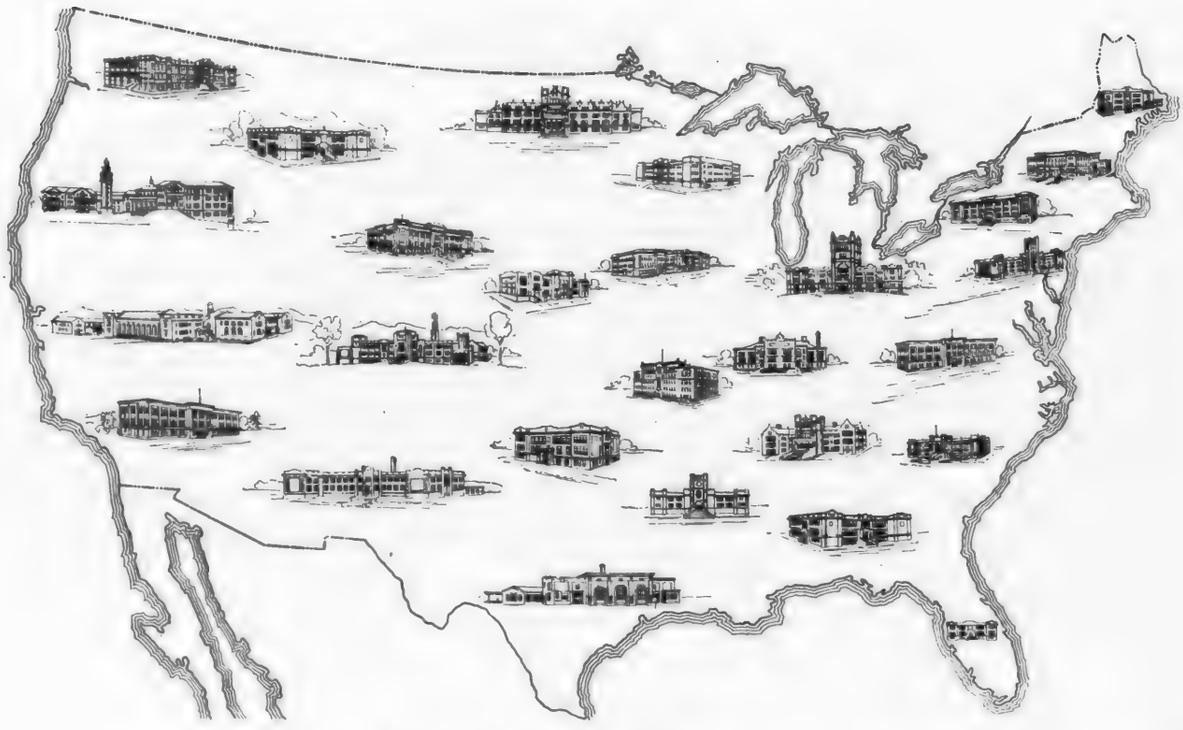
EXCELSO SPECIALTY WORKS, Inc.
59 Clyde Avenue, BUFFALO, N. Y.

District Representatives

210 E. 45th Street New York, N. Y.	32 Oliver St. Boston, Mass.	5939 Haverford Ave. Philadelphia, Pa.

NATIONALLY DISTRIBUTED BY LEADING WHOLESALERS AND BOILER AND RADIATOR MANUFACTURERS

EXCELSO WATER HEATERS
Sold by All Plumbers and Steamfitters



—in schools for a million!

NINE O'CLOCK . . . And more than a million boys and girls answer the roll call in almost 6,000 Webster-heated schools and colleges from Portland, Maine, to Portland, Oregon.

In an ever-lengthening list of American cities, Webster Systems are heating, *not one*, but a *substantial percentage* of the modern school buildings. The preference for Webster Systems is not confined to recent years—nor limited by geographical boundaries. It is nation-wide, as shown by the list at left.

Schools, however, are but one of many types of buildings in which Webster Systems are so largely used. Whether your project be for a school, office building, apartment or what-not, if it's a building of the finer type, it deserves a Webster System—backed by Webster Service. Ask us for details.

Typical "Webster" School Cities

Here is a list of some of the larger American cities which have shown a marked preference for Webster Systems. At the right is the approximate number of Webster-heated schools. Scores of smaller cities and towns have Webster-heated schools almost exclusively.

Atlanta	17
Atlantic City	9
Buffalo	40
Baltimore	9
Camden	11
Chicago	20
Cincinnati	22
Cleveland	30
Denver	50
Detroit	58
Duluth	20
Evansville	14
Fort Wayne	9
Grand Rapids	20
Harrisburg	10
Houston	23
Indianapolis	22
Jersey City	25
Kalamazoo	8
Kansas City	22
Lansing	12
Los Angeles	37
Minneapolis	20
New York	54
Oak Park	10
Omaha	14
Pittsburgh	24
Rochester	11
Saginaw	8
Seattle	38
South Bend	10
Toledo	15

Warren Webster & Company

Pioneers of the Vacuum System of Steam Heating

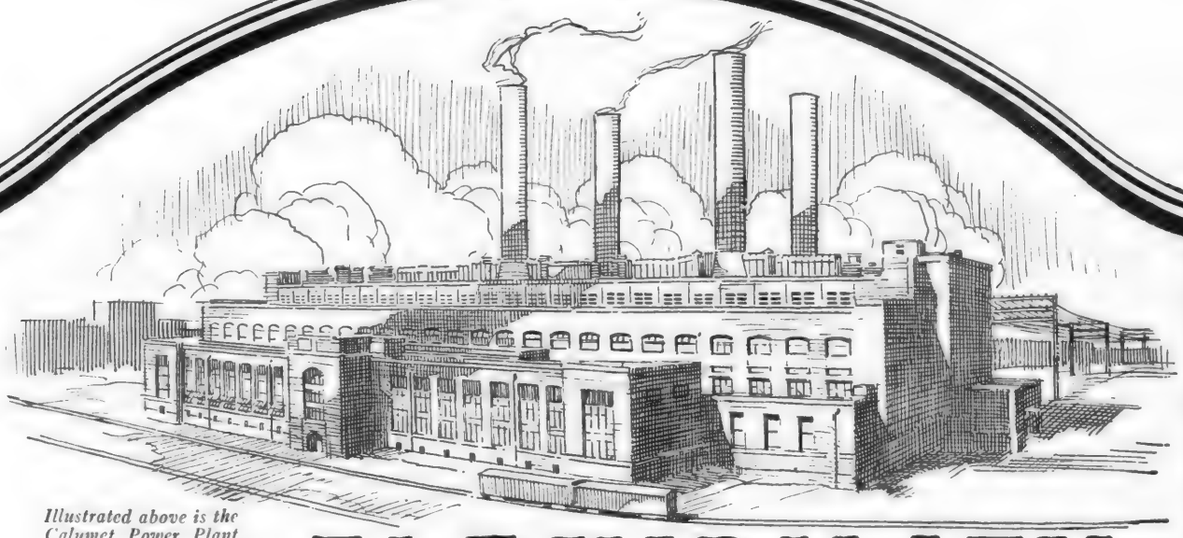
Camden, N. J. 50 Branch Offices

In Canada, Darling Bros., Ltd., Montreal

– since 1888

Webster Systems of Steam Heating

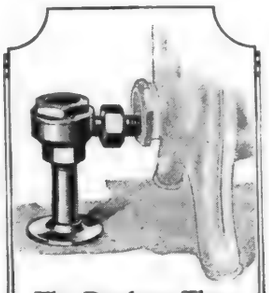
More than 37,000 installations in America's finer buildings



Illustrated above is the Calumet Power Plant of the Commonwealth Edison Company, Chicago

FLEXIBILITY

The quality of flexibility is an essential of modern industry. In the power plant where electricity is generated for lighting and power, if the equipment were not flexible, the plant would be at the mercy of every passing storm cloud, dark day or other peak load call for service. In a modern heating system flexibility is of equal importance.

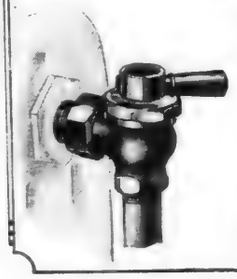


The Dunham Thermostatic Radiator Trap

The silent, efficient watchdog of the coal pile.

The Dunham Packless Radiator Valve

A fitting companion to the Dunham Trap is the Dunham Packless Radiator Valve.



ANY TYPE of heating system which does not take into consideration the requirement of flexibility of operation cannot hope to serve or survive.

The Dunham Low Pressure Steam Heating System is an evolution which has come from a constant striving toward the goal of service. This service is reflected in large measure by the flexibility of a Dunham Heating System.

Dunham Heating is flexible as to climatic range. Our systems are in use in every state in the Union, and in many foreign countries. The climates in which they successfully operate are legion.

Dunham Heating is wonderfully flexible as to sudden variations in outdoor temperature. It contains no large body of water to be heated when sudden cold weather comes, nor does it require a long period of time to provide less heat when cold snaps moderate unexpectedly.

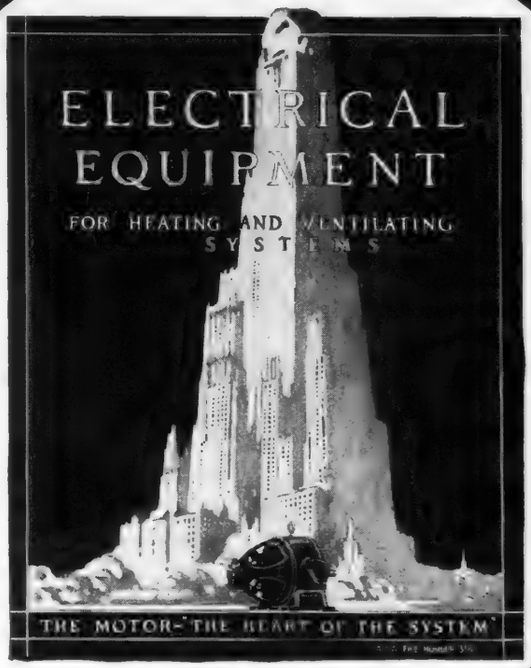
Dunham Heating is flexible as to scope. Rooms not in use may be completely shut off from the system without danger of piping or radiators freezing, for they contain no water. The Dunham Thermostatic Radiator Trap and the Dunham Packless Radiator Valve both perform ideal functions in making the Dunham System the very acme of flexibility and convenience. We believe flexibility to be one of the major advantages of Dunham Heating Service.

Over sixty branch and local sales offices in the United States and Canada bring Dunham Heating Service as close to your office as your telephone. Consult your telephone directory for address of our office in your city.

C. A. DUNHAM CO.

Dunham Building, 450 East Ohio Street, CHICAGO

The DUNHAM REG. TRADE MARK HEATING SERVICE



Have you received a copy?

MOTOR Application Circular 7379 includes formulae and curves that are helpful in figuring heating and ventilating requirements for modern buildings of many types.

It was prepared from data acquired during more than thirty years' experience in the design and application of motor and control equipment for heating and ventilating service.

Your copy will be sent on request. Please use the coupon.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania.
Sales Offices in all Principal Cities of the United States and Foreign Countries

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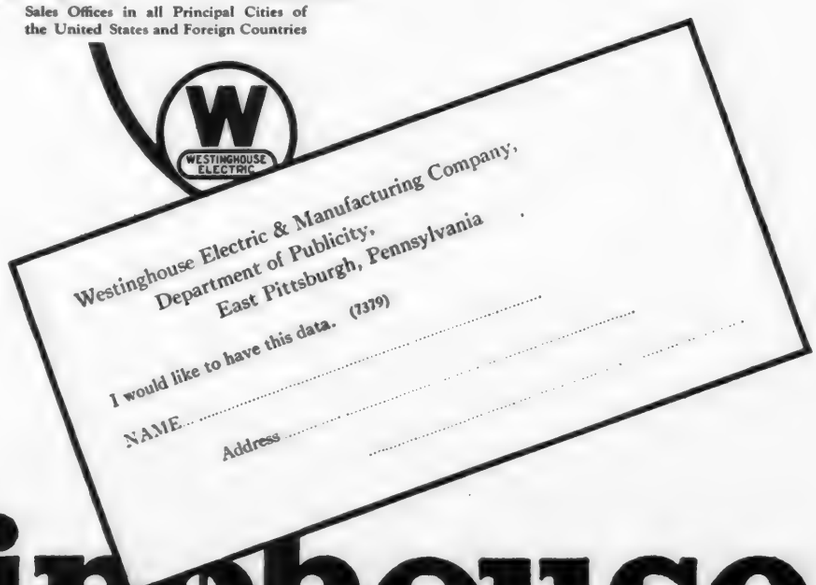
is printed on cover.



Westinghouse

X88706

Now-a

AFTER TWO YEARS of research and tests, Reed engineers, backed by the oldest air filter organization in the country, have perfected and added to the regular line of Reed Standard Units the *Reed Continuous Air Filter.*

(1) No moving parts, no gears, no chains, no sprockets, no bearings—nothing to wear out.
(2) "Streamline" filter bodies (see below) give minimum resistance to air flow and permit highest capacity per unit.

(3) Cleans and charges itself automatically.
(4) Minimum space required—minimum cost.
(5) Standardized units interchangeable and adjustable.
(6) Stationary media—nothing moves but charging liquid.
(7) High cleaning efficiency.
(8) Low resistance.

The Reed Continuous Streamline Filter is made in standard unit sections of 2500 C.F.M. and 5000 C.F.M. Additional units can be connected in any convenient position with minimum use of space. Write for full particulars using the coupon on opposite page.

REED AIR FILTER COMPANY, *Incorporated*
215 Central Avenue, Louisville, Kentucky

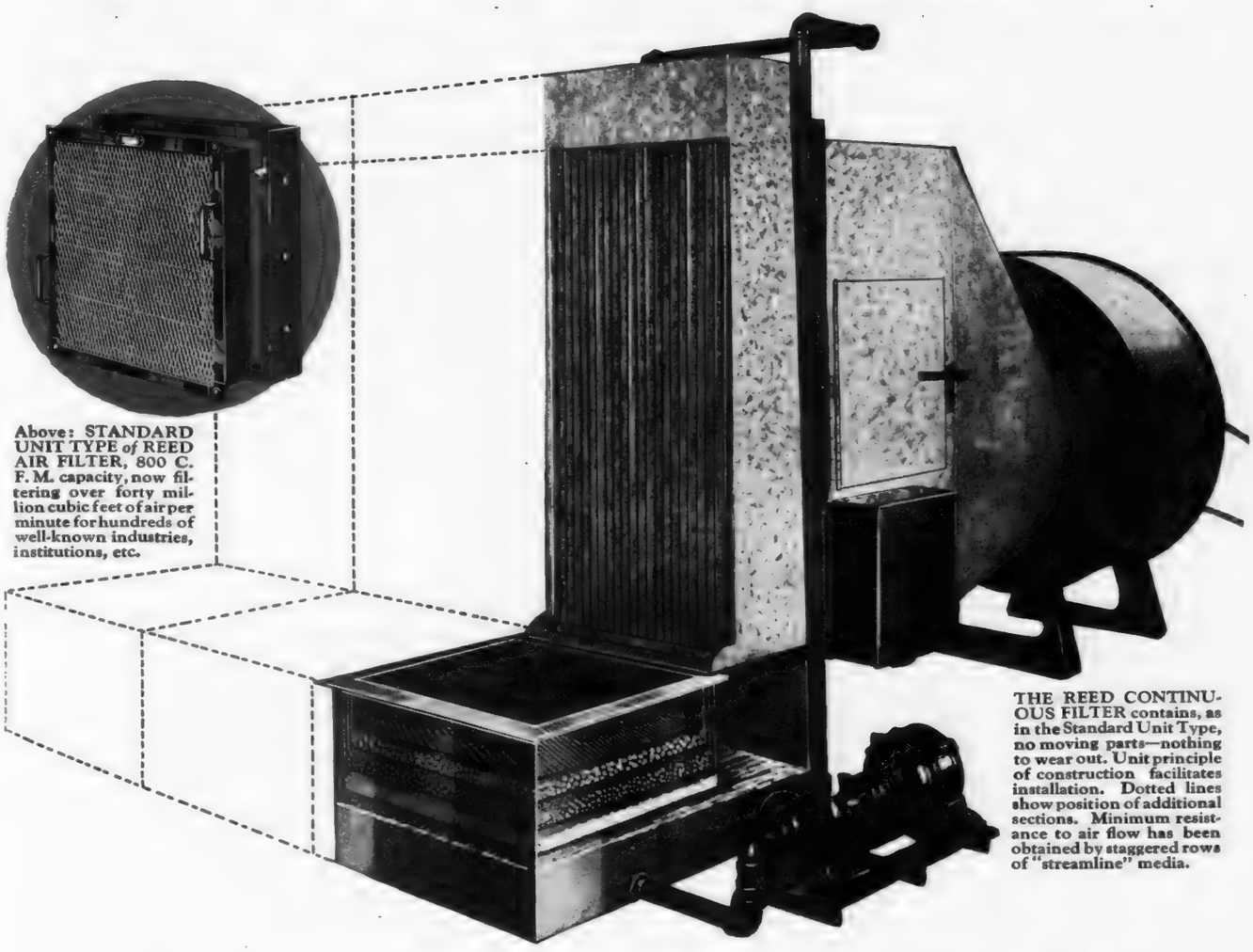
Reed Air

TRADE *filters* ALL METAL MARK

Continuous Streamline

Complete Line of Reed Air Filters

Above: STANDARD UNIT TYPE of REED AIR FILTER, 800 C. F. M. capacity, now filtering over forty million cubic feet of air per minute for hundreds of well-known industries, institutions, etc.



THE REED CONTINUOUS FILTER contains, as in the Standard Unit Type, no moving parts—nothing to wear out. Unit principle of construction facilitates installation. Dotted lines show position of additional sections. Minimum resistance to air flow has been obtained by staggered rows of "streamline" media.

Use This

REED AIR FILTER CO., *Incorporated*
215 Central Ave., Louisville, Kentucky

Send, without obligating me, full particulars about the Reed Standard Unit Air Filter ☐ the Reed Continuous Air Filter ☐

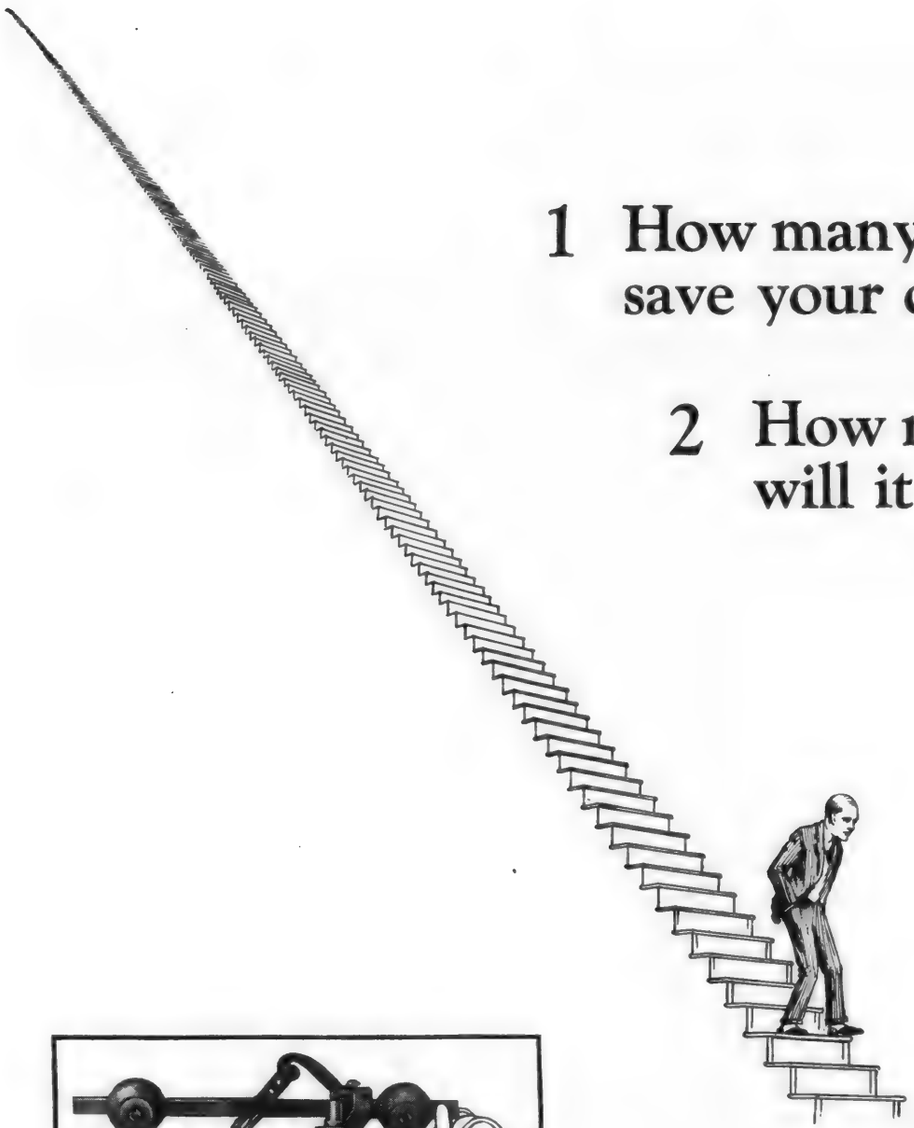
Name..... City..... Possible Use.....

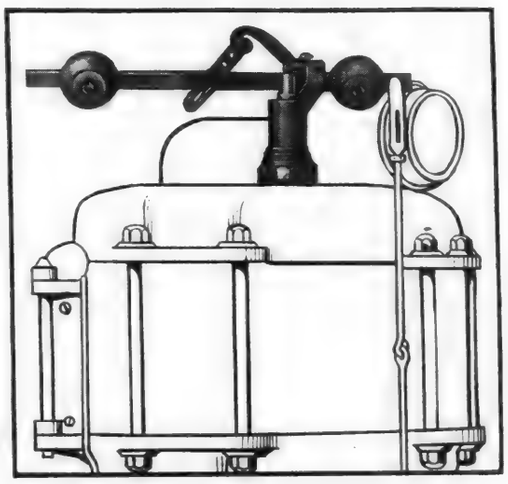
Company..... State.....

and Standard Unit Types

1 How many steps will this save your customer?

2 How many dollars will it make for you?





Arco Water Regulator No. 800

Improves any hot water boiler
Easily installed
Lasts as long as the boiler

Arco Junior Regulator No. 801
for tank heaters

Answer 1

An Arco Water Regulator will save an owner thousands of needless trips to the basement—because it keeps the fire burning evenly without fussing with the dampers. It never forgets—never sleeps. That's all you have to tell an owner to make a sale.

Answer 2

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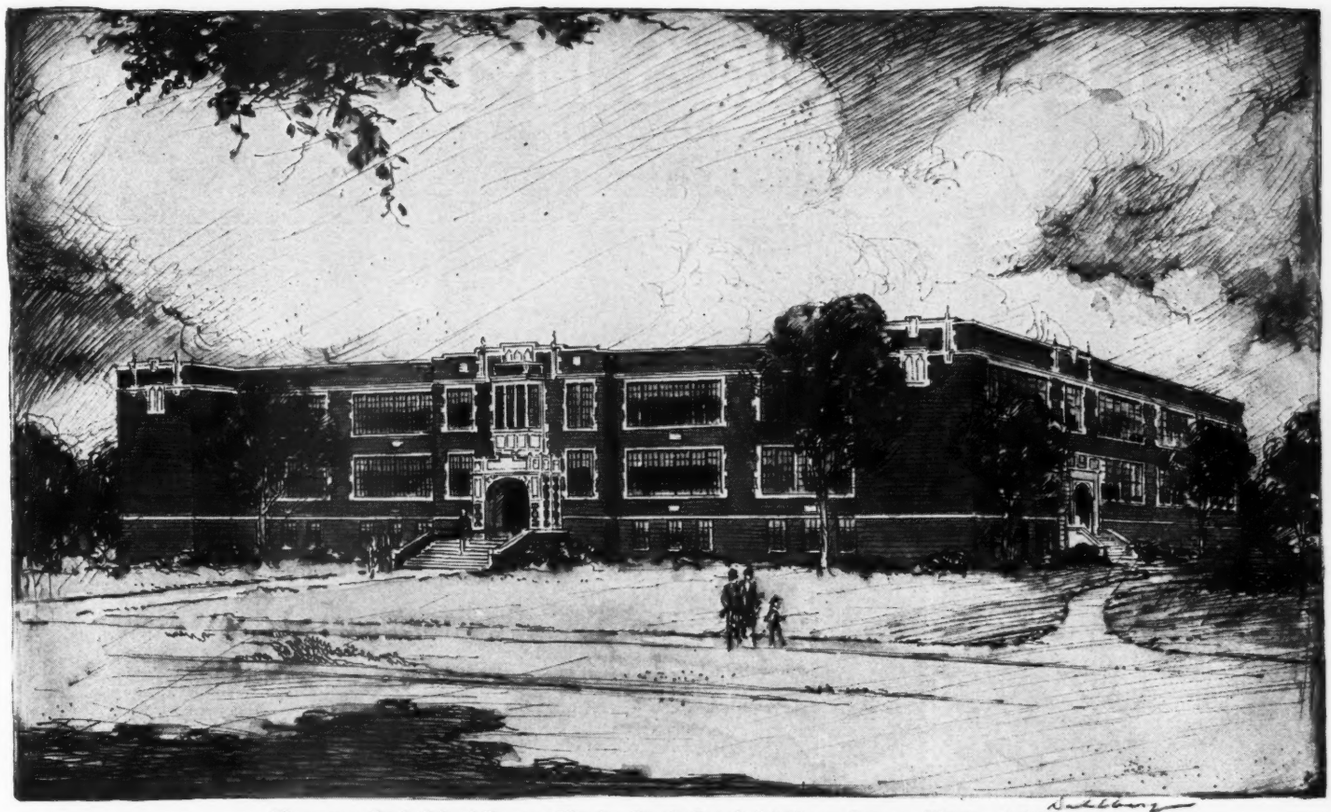
The Arco Water Regulator is manufactured and guaranteed by

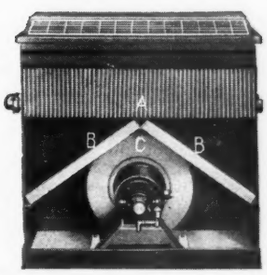
AMERICAN RADIATOR COMPANY

Specialties Department
816 S. Michigan Ave. Chicago, Ill.



Elementary Grade School, Decatur, Illinois. Brooks-Bramhall & Dague, Decatur, Illinois, *Architects*
W. T. Delahunty & Co., Decatur, Illinois, *Heating and Ventilating Contractors*

Now every minute brings recess benefits



Open view of UNIVENT *illustrating*

A—Copper radiator without a single joint, absolutely leak-proof.
B—Air filter easily removable for cleaning.
C—Cone type fan specially insulated for quiet operation.

UNIVENT
(TRADE MARK)
VENTILATION

Like the architect, the Heating and Ventilating Engineer who suggests "Univent Ventilation" builds a reputation for far-seeing judgment. In schools, telephone exchanges, office buildings, hospitals, Univent has proved the simple solution of the ventilating problem.

Univent brings the fresh outdoor air right into the room. It cleanses and warms the air, maintaining a constant circulation without a draft. Each Univent is an independent unit allowing the most effective control of ventilation.

Write for Architect and Engineer's Edition of "Univent Ventilation," and particulars of the helpful co-operation offered by our Engineering Department.

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THE HERMAN NELSON CORPORATION *Moline, Ill.*

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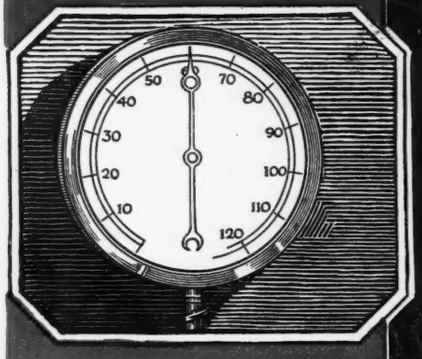
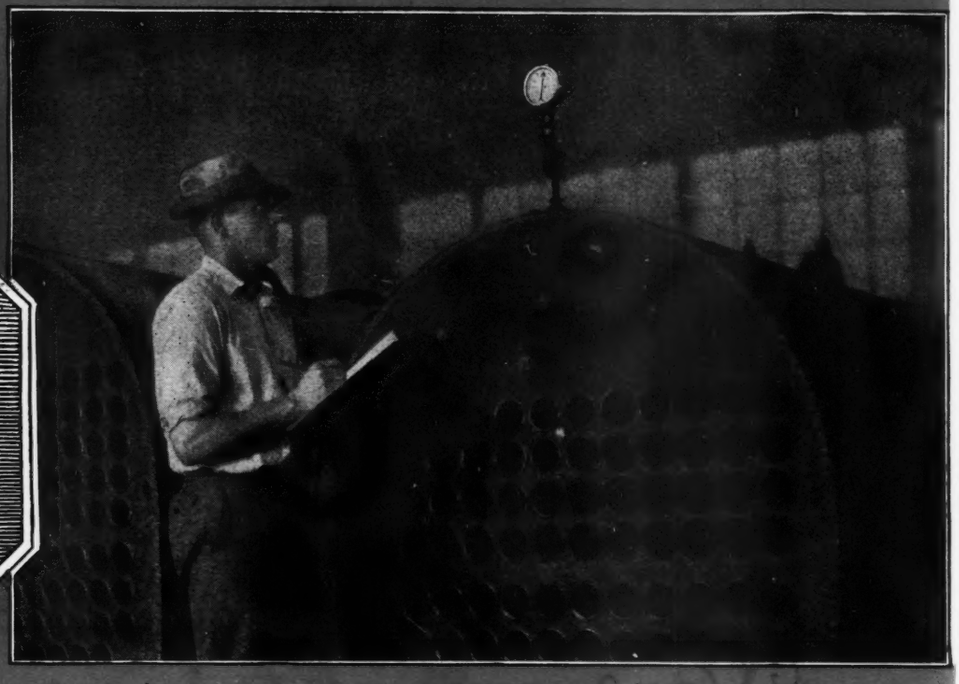
HEGGIE-SIMPLEX

[FORMERLY SIMPLEX]

ELECTRIC-WELDED STEEL BOILERS



Although working pressures never exceed 15 pounds, all Heggie-Simplex Boilers are tested at 60 pounds.



Built to A. S. M. E. Standards—*plus*

The Heggie-Simplex Boiler combines in one portable, electric-welded steel unit all the recognized advantages of both firebox and return tubular, double pass boilers. It has four distinctive features of fundamental importance:

1. Extra large firebox and *direct* heating surface.
2. Secondary combustion chamber to provide ample room for complete combustion before entering flues.
3. "Rear-front-rear" passage for the gases.
4. A single, unimpeded, freely circulating body of water.

Made in both smokeless and direct draft types and in a complete range of sizes for bungalows, residences and all larger installations.

HEGGIE-SIMPLEX Heating Boilers are built to comply strictly with the A. S. M. E. code; but at various points Heggie-Simplex standards are higher.

The code permits the use of 1/4 in. plate in portions of small size low pressure boilers. The lighter plates in even the smallest Heggie-Simplex are 5/16 in. thick—and at practically every point all sizes are made of heavier steel than is required. Every piece of plate is *firebox* steel—because *firebox* is the only quality the mills will guarantee to comply with A. S. M. E. standards.

To code requirements governing welding, Heggie-Simplex has added standards limiting the rate to that at which perfect fusion is assured. The footage of weld per hour is only one-fourth that produced in some shops. But when put to hydrostatic test, Heggie-Simplex Boilers show neither leak nor defect.

Write for catalog with complete data and specifications.

HEGGIE-SIMPLEX BOILER COMPANY, Joliet, Illinois

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Akron, Albuquerque, Amarillo, Atlanta, Baltimore, Birmingham, Buffalo, Casper, Charlotte, Chattanooga, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Davenport, Ia., Dayton, Denver, Des Moines, Detroit, Duluth, Elmira, El Paso, Fort Wayne, Harrisburg, Houston, Indianapolis, Jacksonville

ELECTRIC-WELDED HEGGIE-SIMPLEX STEEL BOILERS

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just look up "Heggie-Simplex Boiler Co." in the phone book in any of the above cities for representative's number and address

The Heating and Ventilating Magazine

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YEARLY SUBSCRIPTION $2.00 **SINGLE COPIES, 30 CENTS**

Published monthly at 1123 Broadway, New York, by the Heating and Ventilating Magazine Co.

Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

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Architects and consulting engineers are readily discovering that automatic temperature regulation in homes and large buildings is positively possible, decidedly successful. The Johnson System's record of results, its design, construction and consistently efficient operation are, naturally, being recognized. It requires but open minded attention and consideration. And the vital necessity for automatic heat control call for such attitude.

Johnson All Metal Design And Construction, Including Thermostats And Valves, Prevent All Possible Failure of Johnson Operation, The Final Advancement To Perfect Automatic Control.

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TWENTY-EIGHT BRANCHES UNITED STATES AND CANADA

JOHNSON

SYSTEM OF TEMPERATURE AND HUMIDITY CONTROL